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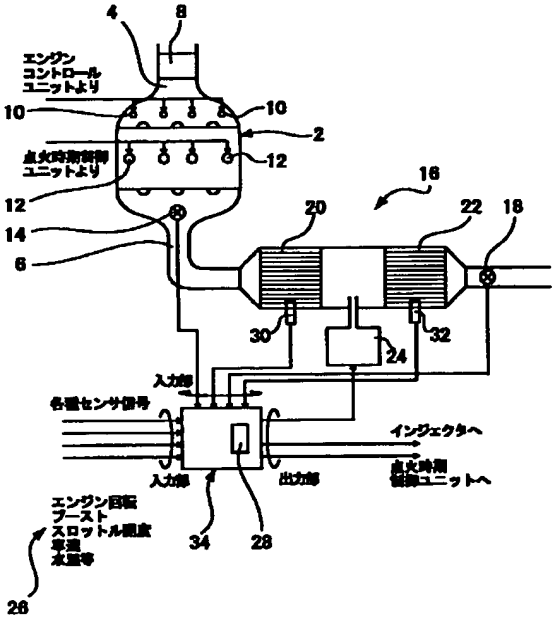
(54)【発明の名称】　内燃機関の排気ガス浄化装置

(57)【要約】　（修正有）
【課題】　燃料及び装置潤滑油の硫黄含量に由来する硫黄化合物による触媒の被毒から回復を行う際に、大気中に硫黄化合物が放出されることの防止、及び硫黄化合物による触媒の被毒の防止を行うこと。
【解決手段】　第１触媒２０と第２触２２媒間の排気通路６に二次エア供給手段２４を設け、第１触媒が被毒しているか否かを検出する被毒検出手段２６を設け、被毒回復制御２８を設けている。また、排気通路に第１触媒を設け、第１触媒よりも上流側に第２触媒を設けた内燃機関の排気ガス浄化装置１６において、第２触媒に吸着量判定手段を設け、硫黄化合物量が設定量を越えた場合に、第１触媒と第２触媒との両方の温度が設定温度を越えているか否かを判定する触媒温度判定手段を設け、第２触媒の被毒回復制御を行う被毒回復制御手段を設けている。



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【特許請求の範囲】

【請求項1】　排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、この第1触媒よりも下流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、前記第1触媒と第2触媒間の排気通路に排気ガスを浄化する二次エアを排気通路に供給可能な二次エア供給手段を設け、前記第1触媒が硫黄化合物によって被毒しているか否かを検出する被毒検出手段を設け、この被毒検出手段により第1触媒の被毒が検出された場合には被毒回復制御を行う被毒回復制御手段を設けたことを特徴とする内燃機関の排気ガス浄化装置。

【請求項2】　前記被毒回復制御手段は、少なくとも空燃比をリッチ化して第1触媒の被毒回復制御を行う請求項1に記載の内燃機関の排気ガス浄化装置。

【請求項3】　前記被毒回復制御手段によって、第1触媒の被毒回復制御を行うと同時に、二次エア供給手段によって、二次エアを第2触媒に供給すべく制御する請求項2に記載の内燃機関の排気ガス浄化装置。

【請求項4】　前記二次エア供給手段は、第1触媒に硫黄吸着能力があると判定された場合にのみ二次エアを第2触媒に供給する請求項3に記載の内燃機関の排気ガス浄化装置。

【請求項5】　前記第1触媒は、三元触媒からなる請求項4に記載の内燃機関の排気ガス浄化装置。

【請求項6】　前記被毒回復制御手段によって、第1触媒の被毒回復制御を行った後に、第1触媒の被毒劣化が解消された場合には、第2触媒の硫黄パージ制御を行う請求項1から請求項4のいずれかに記載の内燃機関の排気ガス浄化装置。

【請求項7】　排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、この第1触媒よりも上流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、前記第2触媒に吸着された硫黄化合物量が設定量を越えているか否かを判定する吸着量判定手段を設け、この吸着量判定手段により硫黄化合物量が設定量を越えたと判断された場合に、第1触媒と第2触媒との両方の温度が設定温度を越えているか否かを判定する触媒温度判定手段を設け、この触媒温度判定手段により2つの触媒の温度が共に設定温度を越えている場合には前記第2触媒の被毒回復制御を行う被毒回復制御手段を設けたことを特徴とする内燃機関の排気ガス浄化装置。

【請求項8】　前記被毒回復制御手段は、空燃比をリッチ化して第2触媒の被毒回復制御を行う請求項7に記載の内燃機関の排気ガス浄化装置。

【請求項9】　前記内燃機関の排気ガス浄化装置は、第1触媒と第2触媒との両方の温度の少なくともいずれか一方が設定温度よりも低い場合に、温度の低い触媒の温度を上昇させるべく制御する触媒温度上昇手段を設けた

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請求項7に記載の内燃機関の排気ガス浄化装置。

【請求項10】　前記被毒回復制御手段は、第1触媒の硫黄吸着能力があると判定された場合にのみ、第2触媒の被毒回復制御を行う請求項7に記載の内燃機関の排気ガス浄化装置。

【請求項11】　前記第2触媒は、少なくともニッケルまたは鉄が担持されている請求項1または請求項7に記載の内燃機関の排気ガス浄化装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は内燃機関の排気ガス浄化装置に係り、特に燃料及び装置潤滑油の硫黄含量に由来する硫黄化合物による触媒の被毒から回復を行う際に、大気中に硫黄化合物が放出されることの防止、及び硫黄化合物による触媒の被毒の防止を行う内燃機関の排気ガス浄化装置に関するものである。

【0002】

【従来の技術】内燃機関の排気ガス中には、主な有害物質として一酸化炭素（CO）、未燃焼炭化水素（HC）及び窒素酸化物（NOx）が存在する。更に、排気ガスは、少量の水素（H2）並びに硫黄酸化物（SOx）を含有し、これらは燃料及び装置潤滑油の硫黄含量に由来する。

【0003】内燃機関の排気ガス浄化装置としては、特開平10-317946号公報に開示されるものがある。この公報に開示される排気浄化装置は、内燃機関の排気管内に配された三元触媒と、排気管内において三元触媒の下流に配されたNOx吸蔵還元触媒とを備え、NOx吸蔵還元触媒にNi又はNiの酸化物を添加し、NOx吸蔵還元触媒の浄化能力を短時間内に復活させている。

【0004】また、特開平11-350945号公報に開示されるものがある。この公報に開示される内燃機関用排ガス浄化装置の運転法は、硫黄トラップ及び窒素酸化物吸蔵触媒からなる排ガス浄化装置を改善している。

【0005】更に、特開2000-42370号公報に開示されるものがある。この公報に開示される排気ガス浄化用触媒装置およびその使用方法は、排気ガス中の硫黄による被毒を防止し、従来の触媒では十分な活性を示さなかったリーン雰囲気下におけるNOx浄化性能を向上させている。

【0006】更にまた、実開昭62-119415号公報に開示されるものがある。この公報に開示される内燃機関の2次空気制御装置は、内燃機関の排気系の排気通路に酸素濃度検出器及び触媒を設け、酸素濃度検出器からの信号によって排気ガスを浄化する2次空気の注入を制御する内燃機関の2次空気制御装置において、触媒の触媒床温度が600度以上800度以下の範囲において2次空気を排気通路に注入する手段を備えている。

【0007】

【発明が解決しようとする課題】ところで、従来の内燃機関の排気ガス浄化装置において、排気ガス浄化用の触媒は、排気ガス中の硫黄化合物（SOx、H2S）等を吸着し、硫黄被毒による性能低下を引き起こしている。

【0008】特に、窒素酸化物（NOx）吸蔵型触媒では、硫黄被毒による影響が甚大であり、硫黄被毒を防ぐ方策が数多く検討されている（例えば、特開平7－217474号公報等）。

【0009】そして、触媒に吸着した硫黄を取り除く、つまり触媒を硫黄被毒から回復させる際には、触媒を硫黄脱離温度（例えば600度）以上とし、且つ空燃比をリッチ化することが必要である。

【0010】このとき、吸着していた硫黄が硫化水素（H2S）となって放出されるため、テールパイプから硫黄臭が発生するという不都合がある。

【0011】また、その他の特許出願においては、触媒の硫黄被毒後にパージ制御を行うものがあるが、この特許出願は、窒素酸化物（NOx）吸蔵型触媒の比較的表層部位のみ脱離できる。

【0012】しかし、触媒層の深い部分の脱離が難しく、硫黄被毒からの回復が十分にできないという不都合がある。

【0013】

【課題を解決するための手段】そこで、この発明は、上述不都合を除去するために、排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、この第1触媒よりも下流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、前記第1触媒と第2触媒間の排気通路に排気ガスを浄化する二次エアを排気通路に供給可能な二次エア供給手段を設け、前記第1触媒が硫黄化合物によって被毒しているか否かを検出する被毒検出手段を設け、この被毒検出手段により第1触媒の被毒が検出された場合には被毒回復制御を行う被毒回復制御手段を設けたことを特徴とする。

【0014】また、排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、この第1触媒よりも上流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、前記第2触媒に吸着された硫黄化合物量が設定量を越えているか否かを判定する吸着量判定手段を設け、この吸着量判定手段により硫黄化合物量が設定量を越えたと判断された場合に、第1触媒と第2触媒との両方の温度が設定温度を越えているか否かを判定する触媒温度判定手段を設け、この触媒温度判定手段により2つの触媒の温度が共に設定温度を越えている場合には前記第2触媒の被毒回復制御を行う被毒回復制御手段を設けたことを特徴とする。

【0015】

【発明の実施の形態】上述の如く発明したことにより、第1触媒が硫黄化合物による被毒から回復するときには、第1触媒の下流側から放出される硫黄化合物を下流側に位置する第2触媒によって吸着し、大気中に硫黄化合物が放出されることを防止している。

【0016】また、第1触媒よりも上流側の排気通路に設けた第2触媒によって、硫黄化合物による被毒を確実に防止している。

【0017】

【実施例】以下図面に基づいてこの発明の実施例を詳細に説明する。

【0018】図1～図4はこの発明の第1実施例を示すものである。図2において、2は内燃機関、4は吸気通路、6は排気通路である。

【0019】前記内燃機関2の吸気系においては、上流側に図示しないスロットルバルブを配置したスロットルボディ8を設け、このスロットルボディ8よりも下流側の吸気通路4を、気筒数に応じて、例えば4つに分岐させ、各分岐吸気通路部分にインジェクタ10を夫々設けるとともに、各気筒上部に点火プラグ12を夫々配設する。

【0020】また、前記内燃機関2の排気系においては、各気筒に連絡する分岐排気通路の合流部位に、酸素センサや空燃比センサ、あるいは窒素酸化物（NOx）センサからなる第1排気センサ14を設け、この第1排気センサ14よりも下流側の排気通路6に排気ガス浄化装置16を設けるとともに、排気ガス浄化装置16よりも下流側の排気通路6に、酸素センサや空燃比センサ、あるいは窒素酸化物（NOx）センサからなる第2排気センサ18を設ける。

【0021】このとき、前記排気ガス浄化装置16は、少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒20と、この第1触媒20よりも下流側に位置し、且つ硫黄化合物を吸着可能な第2触媒22とを有している。

【0022】そして、前記第1触媒20と第2触媒22間の排気通路6に排気ガスを浄化する二次エアを排気通路6に供給可能な二次エア供給手段（「二次エア供給装置」ともいう）24を設け、前記第1触媒20が硫黄化合物によって被毒しているか否かを検出する被毒検出手段26を設け、この被毒検出手段26により第1触媒20の被毒が検出された場合には被毒回復制御を行う被毒回復制御手段28を設ける構成とする。

【0023】詳述すれば、図2に示す如く、前記第1触媒20に第1温度センサ30を設けるとともに、前記第2触媒22に第2温度センサ32を設け、これらの第1、第2温度センサ30、32を制御手段（「コントロールユニット」ともいう）34の入力部側に接続して設ける。

【0024】この制御手段34の入力部側には、第1、第2温度センサ30、32以外にも、第1、第2排気センサ14、18やその他各種センサ、あるいはエンジン回転、ブースト、スロットル開度、車速、水温等を検出する検出手段（図示せず）が接続されている。

【００２５】このとき、前記第１触媒２０が硫黄化合物によって被毒しているか否かを検出する被毒検出手段２６は、前記制御手段３４の入力部側に接続される各種センサ群によって構成される。

【００２６】実際には、被毒検出手段２６により、第１触媒２０が硫黄化合物によって被毒しているか否かの検出は、

（１）図示しないオドメータの読み値

（２）エンジン回転及び図示しないタイマの積分値

（３）硫黄化合物（ＳＯｘ）センサや窒素酸化物（ＮＯｘ）センサの出力値

（４）フロントである第１排気センサ１４及びリヤである第２排気センサ１８による触媒劣化検出

（５）窒素酸化物（ＮＯｘ）吸蔵型触媒である前記第１触媒２０の使用環境が６００度以下である時間の積分値等を用いて行われる。

【００２７】また、前記制御手段３４の出力部側には、インジェクタ１０や点火プラグ１２を制御する点火制御ユニット（図示せず）、二次エア供給手段２４が接続される。

【００２８】そして、前記制御手段３４内に、図２に示す如く、被毒回復制御を行う被毒回復制御手段２８を設けるものである。

【００２９】この被毒回復制御手段２８は、少なくとも空燃比をリッチ化して第１触媒２０の被毒回復制御を行う。すなわち、実際には、空燃比をリッチ化するとともに、内燃機関２の点火時期を、例えば遅角制御する等の方策によって、第１触媒２０を硫黄被毒回復温度（例えば６００度）まで昇温させ、第１触媒２０の硫黄被毒を回復するものである。

【００３０】また、前記被毒回復制御手段２８によって、第１触媒２０の被毒回復制御を行うと同時に、前記制御手段３４から二次エア供給手段２４へ制御信号が出力され、二次エア供給手段２４によって、二次エアを第２触媒２２に供給すべく制御するものである。そして、二次エアを供給することにより、硫化水素を吸着もしくは酸化可能状態とする。

【００３１】このとき、前記二次エア供給手段２４は、第１触媒２０に硫黄吸着能力があると判定された場合にのみ二次エアを第２触媒２２に供給する。なお、二次エアの供給量は、第１触媒２０の状態に応じて増減させるべく設定することが可能である。

【００３２】更に、前記第１触媒２０は、窒素酸化物（ＮＯｘ）吸蔵型触媒からなり、前記第２触媒２２は、少なくともニッケルまたは鉄が担持された触媒からなる。

【００３３】更にまた、前記被毒回復制御手段２８によって、第１触媒２０の被毒回復制御を行った後に、第１触媒２０の被毒劣化が解消された場合には、第２触媒２２の硫黄パージ制御をも行うものである。

【００３４】なお、前記第１触媒２０を、窒素酸化物（ＮＯｘ）吸蔵型触媒とする代わりに、三元触媒とすることも可能である。

【００３５】次に、第１触媒２０を窒素酸化物（ＮＯｘ）吸蔵型触媒とした図１の制御用フローチャートに沿って作用を説明する。なお、図１の制御用フローチャートにおいて、第１触媒２０を「上流触媒」、第２触媒２２を「下流触媒」ともいう。

【００３６】制御用プログラムがスタート（１０２）すると、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号が制御手段３４に取り込まれる（１０４）。

【００３７】そして、上流触媒である第１触媒２０が被毒劣化しているか否かの判断（１０６）を行い、この判断（１０６）がＮＯの場合には、そのまま制御用プログラムのエンド（１２４）に移行させ、判断（１０６）がＹＥＳの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、前記二次エア供給手段２４をＯＮして二次エアを第２触媒２２に供給し、タイマをスタート（１０８）させる。

【００３８】また、所定時間（「被毒回復に必要な時間」と換言できる）の経過後にタイマをエンド（１１０）とし、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＦＦするとともに、前記二次エア供給手段２４をＯＦＦして二次エアの第２触媒２２への供給を中止する（１１２）。

【００３９】その後、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号を制御手段３４に取り込み（１１４）、上流触媒である第１触媒２０が被毒劣化が解消したか否かの判断（１１６）を行う。

【００４０】この判断（１１６）がＮＯの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、前記二次エア供給手段２４をＯＮして二次エアを第２触媒２２に供給し、タイマをスタートさせる処理（１０８）に戻り、判断（１１６）がＹＥＳの場合には、下流触媒である第２触媒２２の硫黄パージ制御をＯＮするとともに、タイマをスタート（１１８）させる。

【００４１】そして、所定時間の経過後にタイマをエンド（１２０）とし、下流触媒である第２触媒２２の硫黄パージ制御をＯＦＦ（１２２）し、制御用プログラムのエンド（１２４）に移行させる。

【００４２】また、前記第１触媒２０を三元触媒とした図３の制御用フローチャートに沿って作用を説明する。

【００４３】制御用プログラムがスタート（２０２）すると、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の

各種信号が制御手段３４に取り込まれる（２０４）。

【００４４】そして、上流触媒である第１触媒２０が被毒劣化しているか否かの判断（２０６）を行い、この判断（２０６）がＮＯの場合には、そのまま制御用プログラムのエンド（２３６）に移行させ、判断（２０６）がＹＥＳの場合には、上流触媒である第１触媒２０に硫黄吸着能力があるか否かの判断（２０８）を行う。

【００４５】この判断（２０８）がＹＥＳの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、前記二次エア供給手段２４をＯＮして二次エアを第２触媒２２に供給し、タイマをスタート（２１０）させ、判断（２０８）がＮＯの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、タイマをスタート（２１２）させる。

【００４６】また、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、前記二次エア供給手段２４をＯＮして二次エアを第２触媒２２に供給し、タイマをスタートさせる処理（２１０）から所定時間の経過後にタイマをエンド（２１４）とし、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＦＦするとともに、前記二次エア供給手段２４をＯＦＦして二次エアの第２触媒２２への供給を中止する（２１６）。

【００４７】その後、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号を制御手段３４に取り込み（２１８）、上流触媒である第１触媒２０が被毒劣化が解消したか否かの判断（２２０）を行う。

【００４８】この判断（２２０）がＮＯの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、前記二次エア供給手段２４をＯＮして二次エアを第２触媒２２に供給し、タイマをスタートさせる処理（２１０）に戻り、判断（２２０）がＹＥＳの場合には、下流触媒である第２触媒２２の硫黄パージ制御をＯＮするとともに、タイマをスタート（２２２）させる。

【００４９】更に、上述した制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、タイマをスタートさせる処理（２１２）から所定時間の経過後にタイマをエンド（２２４）とし、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＦＦする（２２６）。

【００５０】その後、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号を制御手段３４に取り込み（２２８）、上流触媒である第１触媒２０が被毒劣化が解消したか否かの判断（２３０）を行う。

【００５１】この判断（２３０）がＮＯの場合には、制御手段３４内の被毒回復制御手段２８による上流触媒である第１触媒２０の被毒回復制御をＯＮするとともに、タイマをスタートさせる処理（２１２）に戻り、判断（２３０）がＹＥＳの場合には、上述した下流触媒である第２触媒２２の硫黄パージ制御をＯＮするとともに、タイマをスタート（２２２）させる。

【００５２】そして、所定時間の経過後にタイマをエンド（２３２）とし、下流触媒である第２触媒２２の硫黄パージ制御をＯＦＦ（２３４）し、制御用プログラムのエンド（２３６）に移行させる。

【００５３】図４には、この第１実施例における前記排気ガス浄化装置１６を用いた場合の効果を示す図を開示する。

【００５４】これにより、前記第１触媒２０が硫黄化合物による被毒から回復するときに、第１触媒２０の下流側から放出される硫黄化合物を下流側に位置する第２触媒２２によって吸着可能であり、大気中に硫黄化合物が放出されることを防止し得て、実用上有利である。

【００５５】なお、第２触媒２２に吸着した硫黄化合物の脱離は、上流側に位置する第１触媒２０の硫黄化合物が脱離した後に行われることにより、第２触媒２２の硫黄吸着性能を十分に確保でき、且つ硫化水素の排出を防止し得るものである。

【００５６】また、前記被毒回復制御手段２８は、少なくとも空燃比をリッチ化して第１触媒２０の被毒回復制御を行うことにより、第１触媒２０を硫黄被毒から回復させることができる。

【００５７】更に、前記被毒回復制御手段２８によって、第１触媒２０の被毒回復制御を行うと同時に、二次エア供給手段２４によって、二次エアを第２触媒２２に供給すべく制御することにより、第１触媒２０から被毒回復制御により放出される硫黄化合物が、下流側に位置する第２触媒２２にそのまま流入するのを防止でき、第２触媒２２の浄化性能の劣化を未然に防止することが可能である。

【００５８】更にまた、第１触媒２０の劣化がある程度進んだ場合には、硫黄化合物の排出量が減少するので、二次エア供給制御を行う必要がないことにより、前記二次エア供給手段２４に、第１触媒２０に硫黄吸着能力があると判定された場合にのみ二次エアを第２触媒２２に供給する機能を付加し、不要な制御を回避し、制御の信頼性を向上させている。

【００５９】また、前記被毒回復制御手段２８によって、第１触媒２０の被毒回復制御を行った後に、第１触媒２０の被毒劣化が解消された場合には、第２触媒２２の硫黄パージ制御を行うことにより、第１触媒２０の被毒回復制御が完全に終了してから、第２触媒の硫黄パージ制御が行われることとなり、硫黄化合物の放出を確実

に防止することが可能である。

【0060】図5～図7はこの発明の第2実施例を示すものである。この第2実施例において上述第1実施例のものと同一機能を果たす箇所には、同一符号を付して説明する。

【0061】この第2実施例の特徴とするところは、第1触媒20よりも上流側の排気通路6に第2触媒302を配設した点にある。

【0062】すなわち、排気通路6に少なくとも窒素酸化物を吸着または吸蔵可能な窒素酸化物（NOx）吸蔵型触媒からなる第1触媒20を設け、この第1触媒20よりも上流側に硫黄化合物を吸着可能な第2触媒302を設ける。

【0063】そして、前記第2触媒302に吸着された硫黄化合物量が設定量を越えているか否かを判定する吸着量判定手段304を設け、この吸着量判定手段304により硫黄化合物量が設定量を越えたと判断された場合に、第1触媒20と第2触媒302との両方の温度が設定温度を越えているか否かを判定する触媒温度判定手段306を設け、この触媒温度判定手段306により2つの触媒である第1、第2触媒20、302の温度が共に設定温度を越えている場合には前記第2触媒302の被毒回復制御を行う被毒回復制御手段308を設ける構成とする。

【0064】また、この被毒回復制御手段308は、空燃比をリッチ化して第2触媒302の被毒回復制御を行うものである。

【0065】そして、内燃機関2の排気ガス浄化装置310は、第1触媒20と第2触媒302との両方の温度の少なくともいずれか一方が設定温度よりも低い場合に、温度の低い触媒の温度を上昇させるべく制御する触媒温度上昇手段（図示せず）を設ける。

【0066】この触媒温度上昇手段としては、内燃機関2の点火時期を、例えば遅角制御する等によって、第1触媒20あるいは第2触媒302を硫黄被毒回復温度（例えば600度）まで昇温させる方策が考えられる。

【0067】更に、前記被毒回復制御手段308は、第1触媒20の硫黄吸着能力があると判定された場合にのみ、第2触媒302の被毒回復制御を行うものである。

【0068】更にまた、前記第2触媒302は、少なくともニッケルまたは鉄が担持された触媒からなる。

【0069】符号30は第1温度センサ（「温度センサA」ともいう）、32は第2温度センサ（「温度センサB」ともいう）、34は制御手段である。

【0070】なお、前記第1触媒20を、窒素酸化物（NOx）吸蔵型触媒とする代わりに、三元触媒とすることも可能である。

【0071】次に、第1触媒20を窒素酸化物（NOx）吸蔵型触媒とした図6の制御用フローチャートに沿って作用を説明する。なお、図6の制御用フローチャートにおいて、第1触媒20を「下流触媒」、第2触媒22を「上流触媒」ともいう。

【0072】制御用プログラムがスタート（402）すると、エンジン回転やブースト、スロットル開度、車速、第1、第2排気センサ14、18、オドメータ等の各種信号が制御手段34に取り込まれる（404）。

【0073】そして、上流触媒である第2触媒302の硫黄吸着量が大か否かの判断（406）を行い、この判断（406）がNOの場合には、そのまま制御用プログラムのエンド（428）に移行させ、判断（406）がYESの場合には、温度センサAである第1温度センサ30が設定温度である600度を越え、且つ温度センサBである第2温度センサ32が設定温度である600度を越えているか否かの判断（408）に移行させる。

【0074】この判断（408）がYES、つまり第1、第2触媒20、302の両方の温度が設定温度である600度を越えている場合には、制御手段34内の被毒回復制御手段308による上流触媒である第2触媒302の被毒回復制御をONするとともに、空燃比をリッチ化し、タイマをスタートさせる処理（410）に移行させ、判断（408）がNO、つまり第1、第2触媒20、302のいずれか一方の触媒の温度が設定温度である600度以下の場合には、前記触媒温度上昇手段によって、第1触媒20あるいは第2触媒302において温度の低い触媒を硫黄被毒回復温度（例えば600度）まで昇温させる触媒昇温制御をONするとともに、空燃比をリーン化し、タイマをスタートさせる処理（412）に移行させる。

【0075】また、処理（412）の後、所定時間（「被毒回復に必要な時間」と換言できる）の経過後にタイマをエンド（414）とし、前記触媒温度上昇手段による触媒昇温制御をOFF（416）し、その後、エンジン回転やブースト、スロットル開度、車速、第1、第2排気センサ14、18、オドメータ等の各種信号を制御手段34に取り込み（418）、温度センサAである第1温度センサ30が設定温度である600度を越え、且つ温度センサBである第2温度センサ32が設定温度である600度を越えているか否かの判断（408）に戻る。

【0076】上述した制御手段34内の被毒回復制御手段308による上流触媒である第2触媒302の被毒回復制御をONするとともに、空燃比をリッチ化し、タイマをスタートさせる処理（410）の後には、所定時間（「被毒回復に必要な時間」と換言できる）の経過後にタイマをエンド（420）とし、制御手段34内の被毒回復制御手段308による上流触媒である第2触媒302の被毒回復制御をOFFするとともに、空燃比をリーン化してストイキ状態とする（422）。

【0077】その後、エンジン回転やブースト、スロットル開度、車速、第1、第2排気センサ14、18、オ

ドメータ等の各種信号を制御手段３４に取り込み（４２４）、上流触媒である第２触媒３０２が被毒劣化が解消したか否かの判断（４２６）を行う。

【００７８】この判断（４２６）がＮＯの場合には、温度センサＡである第１温度センサ３０が設定温度である６００度を越え、且つ温度センサＢである第２温度センサ３２が設定温度である６００度を越えているか否かの判断（４０８）に戻り、判断（４２６）がＹＥＳの場合には、制御用プログラムのエンド（４２８）に移行させる。

【００７９】また、前記第１触媒２０を三元触媒とした図７の制御用フローチャートに沿って作用を説明する。

【００８０】制御用プログラムがスタート（５０２）すると、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号が制御手段３４に取り込まれる（５０４）。

【００８１】そして、上流触媒である第２触媒３０２の硫黄吸着量が大か否かの判断（５０６）を行い、この判断（５０６）がＮＯの場合には、そのまま制御用プログラムのエンド（５３０）に移行させ、判断（５０６）がＹＥＳの場合には、下流触媒である第１触媒２０に硫黄吸着能力があるか否かの判断（５０８）に移行させる。

【００８２】判断（５０８）がＮＯの場合には、そのまま制御用プログラムのエンド（５３０）に移行させ、判断（５０８）がＹＥＳの場合には、温度センサＡである第１温度センサ３０が設定温度である６００度を越え、且つ温度センサＢである第２温度センサ３２が設定温度である６００度を越えているか否かの判断（５１０）に移行させる。

【００８３】この判断（５１０）がＹＥＳ、つまり第１、第２触媒２０、３０２の両方の温度が設定温度である６００度を越えている場合には、制御手段３４内の被毒回復制御手段３０８による上流触媒である第２触媒３０２の被毒回復制御をＯＮするとともに、空燃比をリッチ化し、タイマをスタートさせる処理（５１２）に移行させ、判断（５１０）がＮＯ、つまり第１、第２触媒２０、３０２のいずれか一方の触媒の温度が設定温度である６００度以下の場合には、前記触媒温度上昇手段によって、第１触媒２０あるいは第２触媒３０２において温度の低い触媒を硫黄被毒回復温度（例えば６００度）まで昇温させる触媒昇温制御をＯＮするとともに、空燃比をリーン化し、タイマをスタートさせる処理（５１４）に移行させる。

【００８４】また、処理（５１４）の後、所定時間（「被毒回復に必要な時間」と換言できる）の経過後にタイマをエンド（５１６）とし、前記触媒温度上昇手段による触媒昇温制御をＯＦＦ（５１８）し、その後、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号を制御手段３４に取り込み（５２０）、温度センサＡである第１温度センサ３０が設定温度である６００度を越え、且つ温度センサＢである第２温度センサ３２が設定温度である６００度を越えているか否かの判断（５１０）に戻る。

【００８５】上述した制御手段３４内の被毒回復制御手段３０８による上流触媒である第２触媒３０２の被毒回復制御をＯＮするとともに、空燃比をリッチ化し、タイマをスタートさせる処理（５１２）の後には、所定時間（「被毒回復に必要な時間」と換言できる）の経過後にタイマをエンド（５２２）とし、制御手段３４内の被毒回復制御手段３０８による上流触媒である第２触媒３０２の被毒回復制御をＯＦＦするとともに、空燃比をリーン化してストイキ状態とする（５２４）。

【００８６】その後、エンジン回転やブースト、スロットル開度、車速、第１、第２排気センサ１４、１８、オドメータ等の各種信号を制御手段３４に取り込み（５２６）、上流触媒である第２触媒３０２が被毒劣化が解消したか否かの判断（５２８）を行う。

【００８７】この判断（５２８）がＮＯの場合には、温度センサＡである第１温度センサ３０が設定温度である６００度を越え、且つ温度センサＢである第２温度センサ３２が設定温度である６００度を越えているか否かの判断（５１０）に戻り、判断（５２８）がＹＥＳの場合には、制御用プログラムのエンド（５３０）に移行させる。

【００８８】これにより、前記第１触媒２０よりも上流側の排気通路６に設けた第２触媒３０２によって、硫黄化合物による被毒を確実に防止することが可能となる。

【００８９】また、前記被毒回復制御手段３０８は、空燃比をリッチ化して第２触媒３０２の被毒回復制御を行うことにより、第２触媒３０２を硫黄被毒から回復させることができる。

【００９０】更に、内燃機関２の排気ガス浄化装置３１０は、第１触媒２０と第２触媒３０２との両方の温度の少なくともいずれか一方が設定温度よりも低い場合に、触媒温度上昇手段（図示せず）によって、温度の低い触媒の温度を上昇させるべく制御することにより、触媒の温度が設定温度を越える場合にのみ被毒回復制御を行うこととなり、硫黄化合物の排出を確実に防止することができる。

【００９１】更にまた、第１触媒２０の劣化がある程度進んだ場合には、硫黄化合物の排出量が減少するので、上流側に位置する第２触媒３０２の被毒回復制御を行う必要がないことにより、前記被毒回復制御手段３０８に、第１触媒２０に硫黄吸着能力があると判定された場合にのみ第２触媒３０２の被毒回復制御を行う機能を付加し、不要な制御を回避し、制御の信頼性を向上させている。

【００９２】なお、この発明は上述第１及び第２実施例に限定されるものではなく、種々の応用改変が可能であ

る。

【0093】例えば、この発明の第1及び第2実施例においては、1個の少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒と、1個の硫黄化合物を吸着可能な第2触媒との合計2個の触媒を配設する構成としたが、3個以上の触媒を配設する特別構成とすることも可能である。

【0094】すなわち、例えば3個の触媒を配設する際には、第1実施例に開示される第1、第2触媒の配設状態において、第1触媒の上流側に硫黄化合物を吸着可能な第3触媒を配設するものである。

【0095】さすれば、第1触媒の上流側及び下流側を硫黄化合物を吸着可能な第3触媒及び第2触媒によって挟むことができ、第3触媒によって第1触媒の硫黄化合物による被毒を確実に防止し得るとともに、第3触媒の性能低下等によって、万一、第1触媒が硫黄化合物によって被毒された場合には、第1触媒の下流側から放出される硫黄化合物を下流側に位置する第2触媒によって吸着可能であり、大気中に硫黄化合物が放出されることを防止し得る。

【0096】

【発明の効果】以上詳細に説明した如くこの本発明によれば、排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、第1触媒よりも下流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、第1触媒と第2触媒間の排気通路に排気ガスを浄化する二次エアを排気通路に供給可能な二次エア供給手段を設け、第1触媒が硫黄化合物によって被毒しているか否かを検出する被毒検出手段を設け、被毒検出手段により第1触媒の被毒が検出された場合には被毒回復制御を行う被毒回復制御手段を設けたので、前記第1触媒が硫黄化合物による被毒から回復するときに、第1触媒の下流側から放出される硫黄化合物を下流側に位置する第2触媒によって吸着可能であり、大気中に硫黄化合物が放出されることを防止し得る。

【0097】また、排気通路に少なくとも窒素酸化物を吸着または吸蔵可能な第1触媒を設け、第1触媒よりも上流側に硫黄化合物を吸着可能な第2触媒を設けた内燃機関の排気ガス浄化装置において、第2触媒に吸着された硫黄化合物量が設定量を越えているか否かを判定する吸着量判定手段を設け、吸着量判定手段により硫黄化合物量が設定量を越えたと判断された場合に、第1触媒と第2触媒との両方の温度が設定温度を越えているか否かを判定する触媒温度判定手段を設け、触媒温度判定手段により2つの触媒の温度が共に設定温度を越えている場合には第2触媒の被毒回復制御を行う被毒回復制御手段を設けたので、前記第1触媒よりも上流側の排気通路に設けた第2触媒によって、第1触媒の硫黄化合物による被毒を確実に防止することが可能である。

【図面の簡単な説明】

【図1】この発明の第1実施例を示す第1触媒を窒素酸化物（NOx）吸蔵型触媒とした制御用フローチャートである。

【図2】内燃機関の排気ガス浄化装置の概略構成図である。

【図3】第1触媒を三元触媒とした制御用フローチャートである。

【図4】硫化水素（H2S）検出量と経過時間とを示す図である。

【図5】この発明の第2実施例を示す第1触媒を窒素酸化物（NOx）吸蔵型触媒とした制御用フローチャートである。

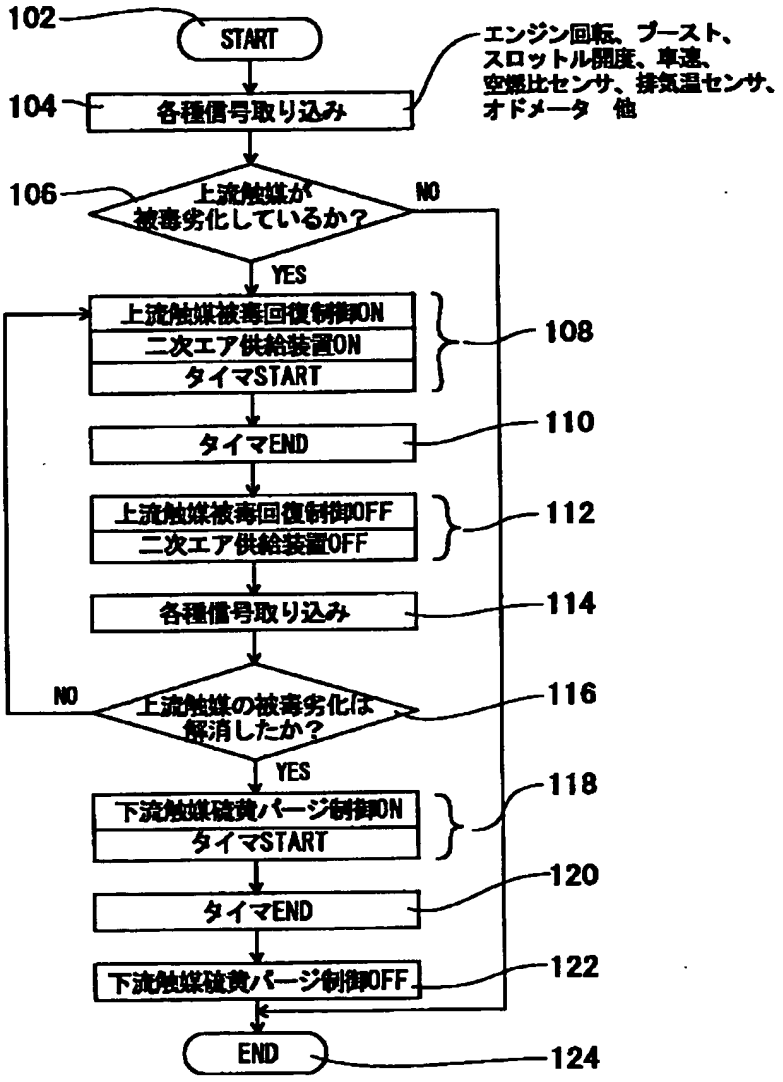
【図6】内燃機関の排気ガス浄化装置の概略構成図である。

【図7】第1触媒を三元触媒とした制御用フローチャートである。

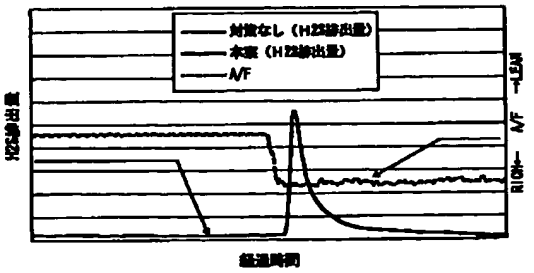
【符号の説明】

2　内燃機関
4　吸気通路
6　排気通路
8　スロットルボディ
10　インジェクタ
12　点火プラグ
14　第1排気センサ
16　排気ガス浄化装置
18　第2排気センサ
20　第1触媒
22　第2触媒
24　二次エア供給手段（「二次エア供給装置」ともいう）
26　被毒検出手段
28　被毒回復制御手段
30　第1温度センサ
32　第2温度センサ
34　制御手段（「コントロールユニット」ともいう）

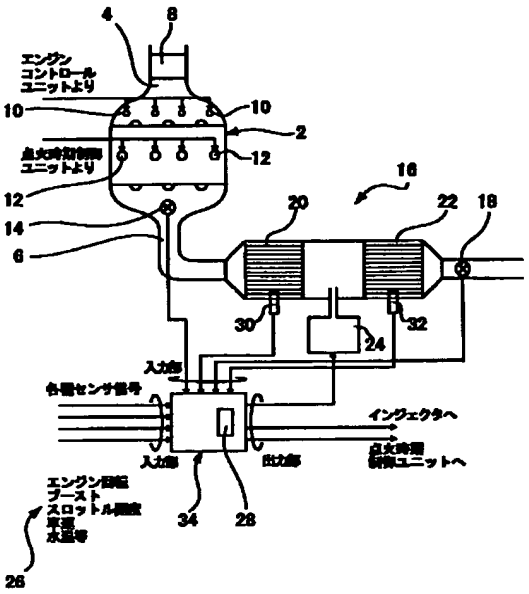
【図1】


102
START
104
各種信号取り込み
エンジン回転、ブースト、
スロットル開度、車速、
空燃比センサ、排気温センサ、
オドメータ　他
106
上流触媒が
被毒劣化しているか？
NO
YES
上流触媒被毒回復制御ON
二次エア供給装置ON
タイマSTART
108
タイマEND
110
上流触媒被毒回復制御OFF
二次エア供給装置OFF
112
各種信号取り込み
114
上流触媒の被毒劣化は
解消したか？
NO
116
YES
下流触媒硫黄パージ制御ON
タイマSTART
118
タイマEND
120
下流触媒硫黄パージ制御OFF
122
END
124

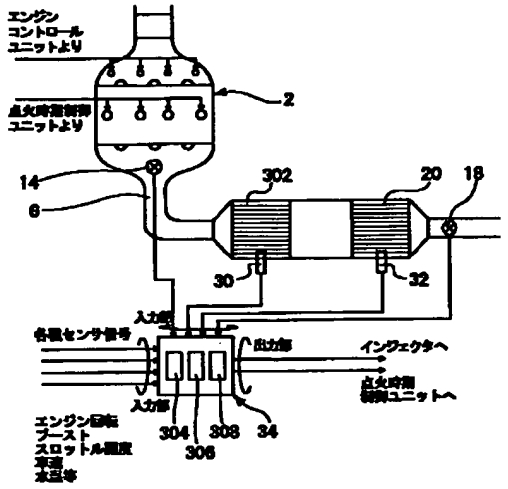
【図4】


対策なし（H2S排出量）
本案（H2S排出量）
A/F
H2S排出量
A/F
経過時間

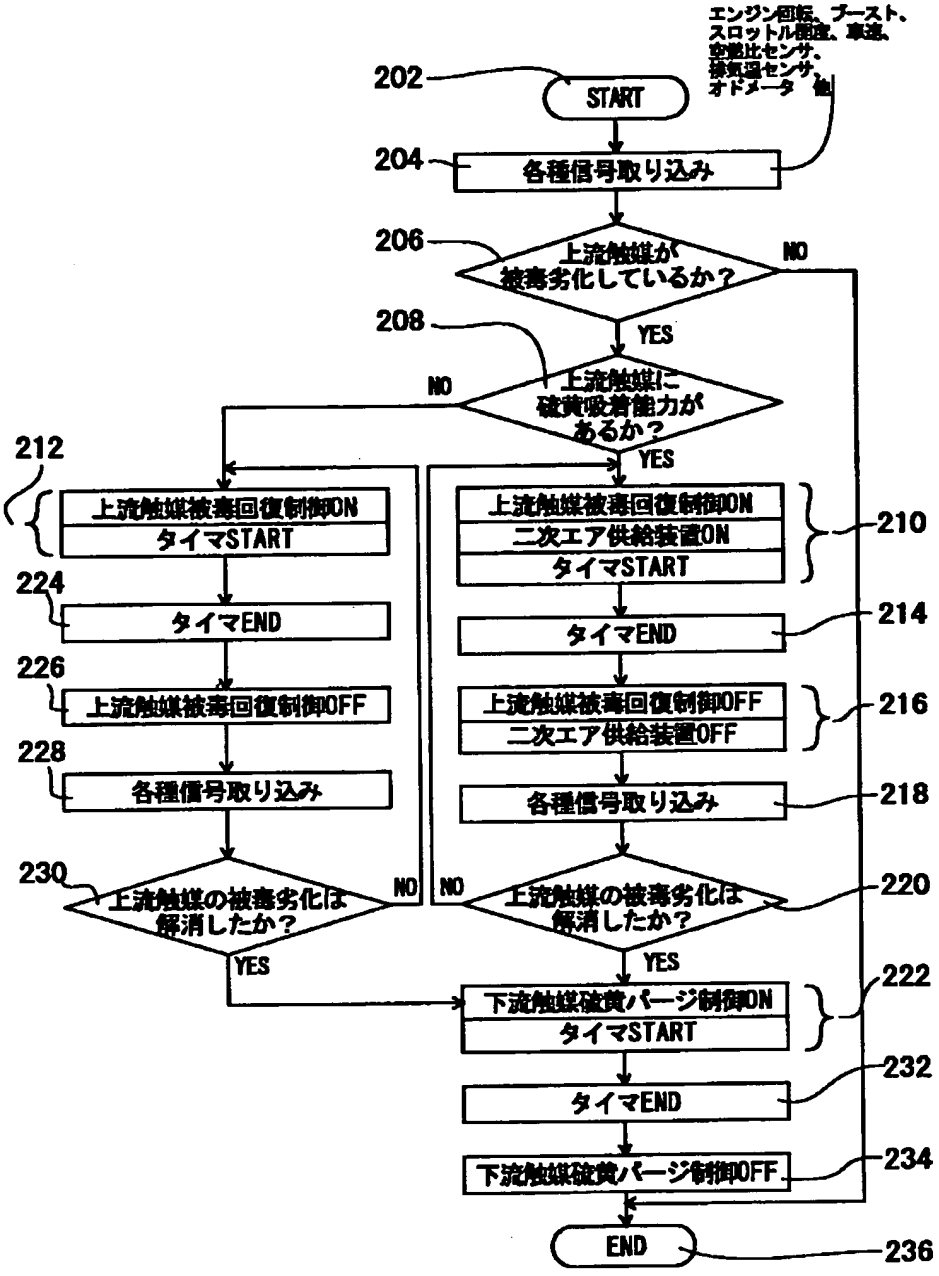
【図2】


4
8
エンジン
コントロール
ユニットより
10
10
2
点火時期制御
ユニットより
12
12
16
14
20
22
18
6
30
24
32
入力部
各種センサ信号
インジェクタへ
点火時期
制御ユニットへ
入力部
出力部
エンジン回転
ブースト
スロットル開度
冷温
水温等
34
28
26

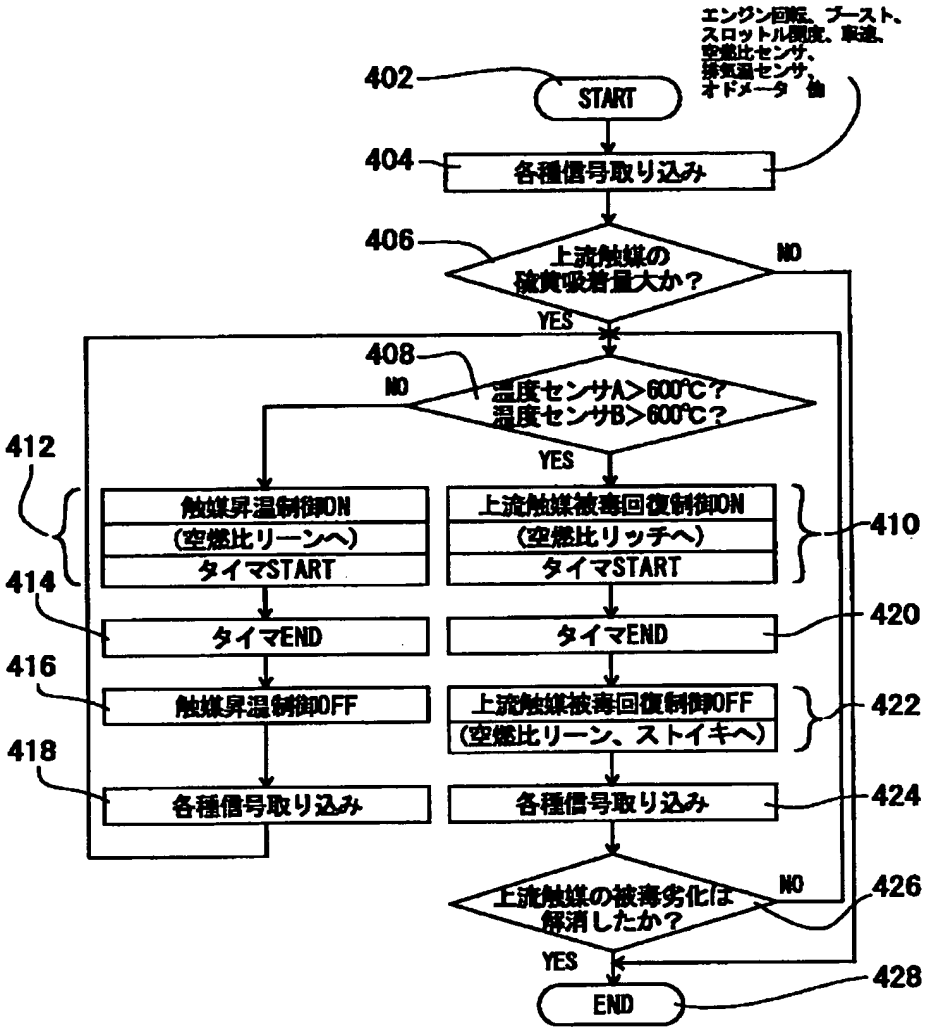
【図5】


エンジン
コントロール
ユニットより
2
点火時期制御
ユニットより
14
302
20
18
6
30
32
入力部
各種センサ信号
出力部
インジェクタへ
点火時期
制御ユニットへ
入力部
エンジン回転
ブースト
スロットル開度
冷温
水温等
304
308
34
306

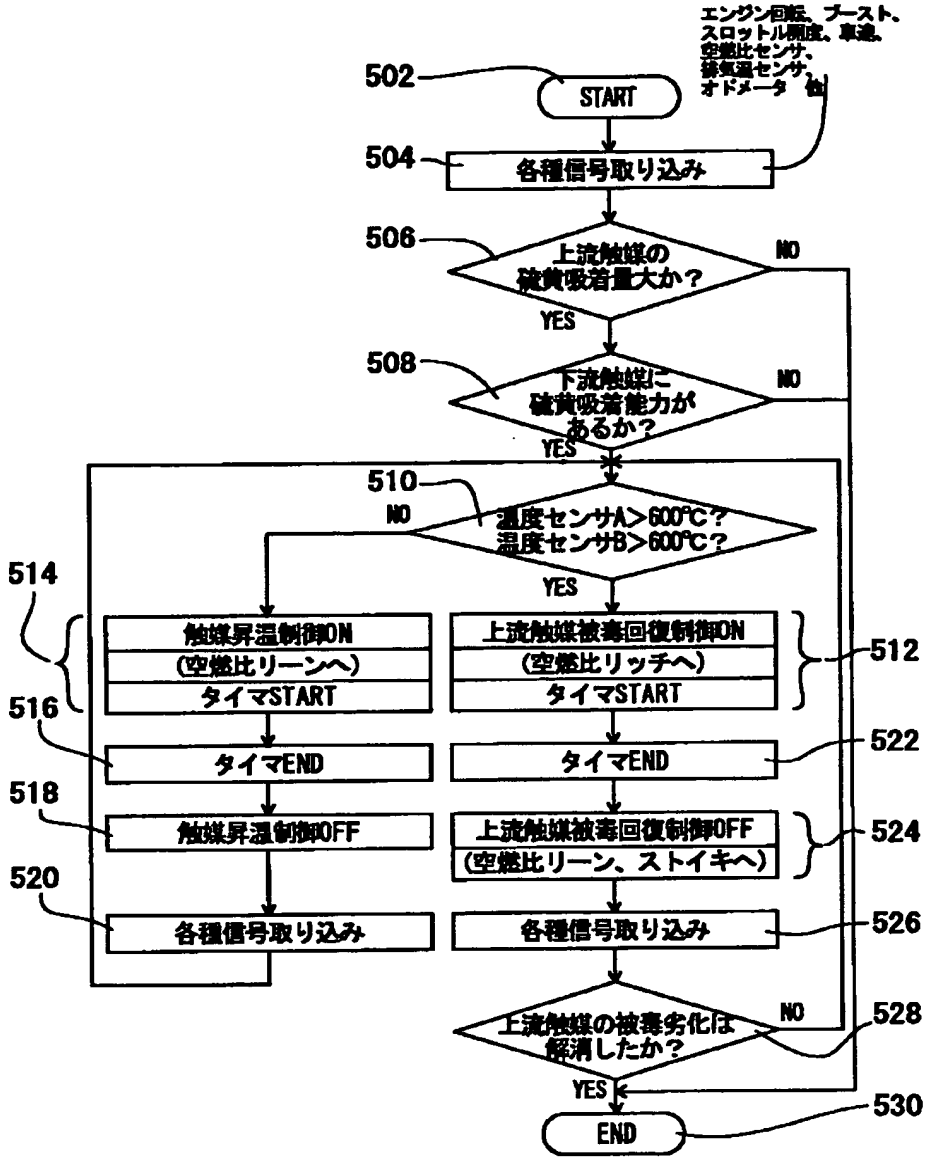
【図3】


エンジン回転、ブースト、
スロットル開度、車速、
空燃比センサ、
排気温センサ、
オドメータ　他
202
START
204
各種信号取り込み
206
上流触媒が
被毒劣化しているか？
NO
YES
208
上流触媒に
硫黄吸着能力が
あるか？
NO
YES
212
上流触媒被毒回復制御ON
タイマSTART
224
タイマEND
226
上流触媒被毒回復制御OFF
228
各種信号取り込み
230
上流触媒の被毒劣化は
解消したか？
NO
YES
上流触媒被毒回復制御ON
二次エア供給装置ON
タイマSTART
210
214
タイマEND
上流触媒被毒回復制御OFF
二次エア供給装置OFF
216
218
各種信号取り込み
NO
220
上流触媒の被毒劣化は
解消したか？
YES
下流触媒硫黄パージ制御ON
タイマSTART
222
232
タイマEND
下流触媒硫黄パージ制御OFF
234
END
236

【図6】


エンジン回転、ブースト、
スロットル開度、車速、
空燃比センサ、
排気温センサ、
オドメータ　他
402
START
404
各種信号取り込み
406
上流触媒の
硫黄吸着量大か？
NO
YES
408
温度センサA>600℃？
温度センサB>600℃？
NO
YES
412
触媒昇温制御ON
(空燃比リーンへ)
タイマSTART
上流触媒被毒回復制御ON
(空燃比リッチへ)
タイマSTART
410
414
タイマEND
420
タイマEND
416
触媒昇温制御OFF
上流触媒被毒回復制御OFF
(空燃比リーン、ストイキへ)
422
418
各種信号取り込み
424
各種信号取り込み
上流触媒の被毒劣化は
解消したか？
NO
426
YES
428
END

【図7】



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F02D	41/04	305		41/14	310K
	41/14	310			310P
				43/00	301E

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45/00	312				312T
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AB03 AB06 AB08 BA11 BA14
BA20 BA33 CA22 CB02 DA01
DA02 DA04 DB06 DB10 DC01
EA01 EA06 EA16 EA18 EA30
EA33 EA34 EA38 EA39 FB03
FB10 FB12 FC08 GA06 GB01W
HA08 HA36 HA39 HA42 HA47
HB07
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JA25 JB09 LA01 LB02 MA01
MA11 MA18 NA04 NA06 NA07
NA08 ND01 NE01 NE06 NE13
NE15 PA07A PA07B PD01A
PD01B PD12A PD12B PE01A
PE01B PF01A PF01B
4D048 AA02 AA06 AA13 AA18 AB01
AB02 BA36Y BA38Y BC01
BD02 DA01 DA02

DERWENT-ACC-NO: 2003-007372

DERWENT-WEEK: 200305

TITLE: **Exhaust gas** purifier for internal combustion **engine, has poison detector** and control mechanism which recovers front catalyst poisoned with excess sulfur compound

PATENT-ASSIGNEE: SUZUKI KK[SUZM]

PRIORITY-DATA: 2001JP-0116340 (April 16, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 2002309929 A	October 23, 2002	N/A	014	F01N 003/20

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
JP2002309929A	N/A	2001JP-0116340	April 16, 2001

INT-CL (IPC): B01D053/86, F01N003/08 , F01N003/20 , F01N003/22 , F01N003/24 , F01N003/28 , F02D041/04 , F02D041/14 , F02D043/00 , F02D045/00

ABSTRACTED-PUB-NO: JP2002309929A

BASIC-ABSTRACT:

NOVELTY - A supply mechanism (24) supplies purification air to an exhaust route formed in between front catalyst (20) and a rear catalyst (22). A detector (26) detects

whether the front catalyst is poisoned with excess amount of sulfur compound. A control mechanism (28) recovers poisoned front catalyst by enriching air fuel ratio.

USE - For purification of **exhaust gas** in internal combustion **engine**.

ADVANTAGE - Prevents emission of **sulfur compound (SOx, hydrogen sulfide** etc.) into atmosphere by providing **poison detector** and control mechanisms.

DESCRIPTION OF DRAWING(S) - The figure shows a block diagram of an **exhaust gas** purifier of an internal combustion **engine**. (Drawing includes non-English language text).

Front catalyst 20

Rear catalyst 22

Air supply mechanism 24

Poison detector 26

Control mechanism 28

CHOSEN-DRAWING: Dwg.2/7

TITLE-TERMS: **EXHAUST GAS** PURIFICATION INTERNAL COMBUST **ENGINE** POISON DETECT CONTROL MECHANISM RECOVER FRONT CATALYST POISON EXCESS SULPHUR COMPOUND

DERWENT-CLASS: E19 E36 H06 J01 J04 Q51 Q52 X22

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CHEMICAL-CODES: Chemical Indexing M3 *01* Fragmentation Code C108 C316 C540 C730 C800 C801 C802 C803 C804 C805 M411 M424 M740 M750 M904 M905 M910 N163 Q431 Q436 Q439 Specfic Compounds 01675K 01675X Registry Numbers 1675U

Chemical Indexing M3 *02* Fragmentation Code C108 C216 C540 C730 C800 C801 C802 C803 C804 C805 M411 M424 M740 M750 M904 M905 M910 N163 Q431 Q436 Q439 Specfic Compounds

01674K 01674X Registry Numbers 1674U

Chemical Indexing M3 *03* Fragmentation Code C101 C116 C540 C730 C800 C801 C802 C804 C805 C806 M411 M424 M740 M750 M904 M905 M910 N163 Q431 Q436 Q439 Specfic Compounds 01785K 01785X A01M1K A01M1X Registry Numbers 1785U

Chemical Indexing M3 *04* Fragmentation Code C107 C108 C307 C520 C730 C800 C801 C802 C803 C804 C807 M411 M424 M740 M750 M904 M905 M910 N163 Q431 Q436 Q439 Specfic Compounds 01881K 01881X Registry Numbers 1881U

Chemical Indexing M3 *05* Fragmentation Code C108 C307 C520 C730 C800 C801 C802 C803 C804 C807 M411 M424 M740 M750 M904 M905 M910 N163 Q431 Q436 Q439 Specfic Compounds 01902K 01902X Registry Numbers 1902U

Chemical Indexing M3 *06* Fragmentation Code C107 C108 C520 C730 C800 C801 C802 C803 C804 C807 M411 M424 M740 M750 M904 M905 N163 Q431 Q436 Q439 Specfic Compounds 01901K 01901X Registry Numbers 1901U

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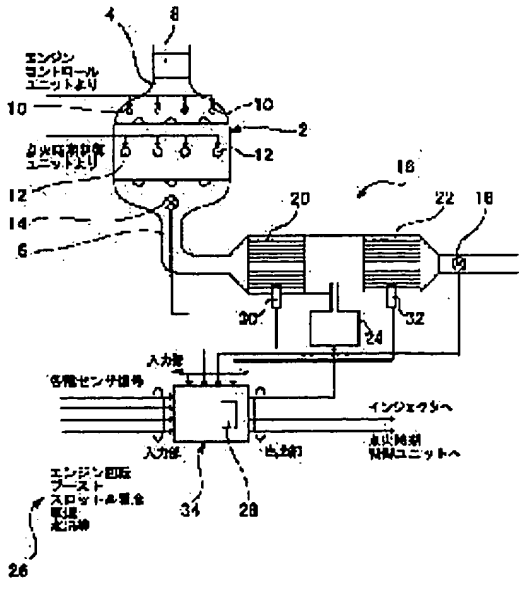
(54) EXHAUST EMISSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent emission of a sulfur compound to the atmosphere during recovery of a catalyst poisoned due to the sulfur compound derived from sulfur contents in fuel and device lubricant and to prevent the catalyst poisoning due to the sulfur compound.

SOLUTION: This exhaust emission control device is provided with a secondary air supply means 24 arranged in an exhaust passage 6 between a first catalyst 10 and a second catalyst



22, a poisoning detection means 26 detecting whether the first catalyst is poisoned or not, and a poisoning recovery control 28. The exhaust emission control device 16, which has the first catalyst arranged in the exhaust passage and the second catalyst arranged on the upstream side beyond the first catalyst, for an internal combustion device is provided with an adsorption quantity determination means arranged in the second catalyst, a catalyst temperature determination means determining whether the both temperatures of the first catalyst and the second catalyst exceed a set temperature or not, and a poisoning recovery controlling means performing poisoning recovery control for the second catalyst.

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] In the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the downstream rather than this 1st catalyst The secondary air supply means which can be supplied to a flueway is formed for the secondary air which purifies exhaust gas in the flueway between said 1st catalyst and 2nd catalyst. The exhaust gas purge of the internal combustion engine characterized by having established a poisoning detection means to detect whether said 1st catalyst is carrying out poisoning with the sulfur compound, and establishing the poisoning recovery control means which performs poisoning recovery control when poisoning of the 1st catalyst is detected by this poisoning detection means.
[Claim 2] Said poisoning recovery control means is the exhaust gas purge of the internal combustion engine according to claim 1 which makes an air-fuel ratio rich at least, and performs poisoning recovery control of the 1st catalyst.
[Claim 3] The exhaust gas purge of an internal combustion engine according to claim 2 controlled by said poisoning recovery control means with a secondary air supply means that secondary air should be supplied to the 2nd catalyst at the same time it performs poisoning recovery control of the 1st catalyst.
[Claim 4] It is the exhaust gas purge of the internal combustion engine according to claim 3 which supplies secondary air to the 2nd catalyst only when judged with said secondary air supply means having the sulfur adsorption capacity force in the 1st catalyst.
[Claim 5] Said 1st catalyst is the exhaust gas purge of the internal combustion engine according to claim 4 which consists of a three way component catalyst.
[Claim 6] The exhaust gas purge of an internal combustion engine given in either of claim 1 to claims 4 which perform sulfur purge control of the 2nd catalyst when poisoning degradation of the 1st catalyst is canceled by said poisoning recovery control means after performing poisoning recovery control of the 1st catalyst.
[Claim 7] In the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the upstream rather than this 1st catalyst An amount-of-adsorption judging means to judge

whether the amount of sulfur compounds in which said 2nd catalyst was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with this amount-of-adsorption judging means A judgment means is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst and the 2nd catalyst is over laying temperature]. The exhaust gas purge of the internal combustion engine characterized by establishing the poisoning recovery control means which performs poisoning recovery control of said 2nd catalyst when both the temperature of two catalysts is over laying temperature with the judgment means whenever [this catalyst temperature].

[Claim 8] Said poisoning recovery control means is the exhaust gas purge of the internal combustion engine according to claim 7 which makes an air-fuel ratio rich and performs poisoning recovery control of the 2nd catalyst.

[Claim 9] Said internal combustion engine's exhaust gas purge is an exhaust gas purge of the internal combustion engine according to claim 7 which established the rise means whenever [catalyst temperature / which is controlled in order to raise the temperature of a catalyst with low temperature, when / of the temperature of both the 1st catalyst and the 2nd catalyst / either is lower than laying temperature at least].

[Claim 10] It is the exhaust gas purge of the internal combustion engine according to claim 7 which performs poisoning recovery control of the 2nd catalyst only when judged with said poisoning recovery control means having the sulfur adsorption capacity force of the 1st catalyst.

[Claim 11] Said 2nd catalyst is the exhaust gas purge of the internal combustion engine according to claim 1 or 7 with which nickel or iron is supported at least.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In case recovery is performed from poisoning of the catalyst by the sulfur compound which this invention requires for an internal combustion engine's exhaust gas purge, especially originates in the sulfur content of a fuel and an equipment lubricating oil, it is related with prevention of a sulfur compound being emitted into atmospheric air, and the exhaust gas purge of the internal combustion engine which prevents poisoning of the catalyst by the sulfur compound.
[0002]
[Description of the Prior Art] In an internal combustion engine's exhaust gas, a carbon monoxide (CO), a non-burned hydrocarbon (HC), and nitrogen oxides (NOx) exist as main harmful matter. Furthermore, exhaust gas contains a sulfur oxide (SOx) in a little hydrogen (H2) list, and these originate in the sulfur content of a fuel and an equipment lubricating oil.
[0003] There are some which are indicated by JP,10-317946,A as an internal combustion engine's exhaust gas purge. The exhaust emission control device indicated by this official report is equipped with the three way component catalyst allotted in an internal combustion engine's exhaust pipe, and the NOx occlusion reduction catalyst allotted in the exhaust pipe on the lower stream of a river of a three way component catalyst, adds the oxide of nickel or nickel to an NOx occlusion reduction catalyst, and is reviving the purification capacity of an NOx occlusion reduction catalyst in a short time.
[0004] Moreover, there are some which are indicated by JP,11-350945,A. The method of operating the exhaust gas purge for internal combustion engines indicated by this official report has improved the exhaust gas purge which consists of a sulfur trap and a nitrogen-oxides occlusion catalyst.
[0005] Furthermore, there are some which are indicated by JP,2000-42370,A. The catalyst equipment for exhaust gas purification indicated by this official report and its operation prevent poisoning with the sulfur in exhaust gas, and are raising the NOx purification engine performance under the lean atmosphere which did not show activity sufficient with the conventional catalyst.
[0006] Furthermore, there are some which are indicated by JP,62-119415,U again. An

internal combustion engine's secondary air control unit indicated by this official report prepared the oxygen density detector and the catalyst in the flueway of an internal combustion engine's exhaust air system, and is equipped with a means by which whenever [catalyst floor temperature / of a catalyst] pours secondary air into a flueway in the range of 800 or less degrees 600 degrees or more, in the secondary air control unit of the internal combustion engine which controls impregnation of the secondary air which purifies exhaust gas with the signal from an oxygen density detector.
[0007]
[Problem(s) to be Solved by the Invention] By the way, in the conventional internal combustion engine's exhaust gas purge, the catalyst for exhaust gas purification adsorbed the sulfur compound in exhaust gas (SOx, H2S) etc., and has caused the degradation by sulfur poisoning.
[0008] Especially, many policies from which the effect by sulfur poisoning is serious, and protects sulfur poisoning are worked on by the nitrogen-oxides (NOx) occlusion mold catalyst (for example, JP,7-217474,A etc.).
[0009] And the sulfur which stuck to the catalyst is removed, that is, in case a catalyst is recovered from sulfur poisoning, it is required to carry out a catalyst to beyond sulfur desorption temperature (for example, 600 degrees), and to make an air-fuel ratio rich.
[0010] Since the sulfur to which it was sticking serves as a hydrogen sulfide (H2S) at this time and it is emitted, there is un-arranging [that sulfurous odour occurs from a tail pipe].
[0011] moreover -- although there are some which perform purge control after sulfur poisoning of a catalyst in other patent application -- this patent application -- a nitrogen-oxides (NOx) occlusion mold catalyst -- it can be comparatively desorbed only from a surface part.
[0012] However, there is un-arranging [that the desorption of the deep part of a catalyst bed is difficult, and recovery from sulfur poisoning cannot fully be performed].
[0013]
[Means for Solving the Problem] Then, in order that this invention may remove un-[above-mentioned] arranging, the 1st catalyst in which adsorption or occlusion is possible is prepared for nitrogen oxides in a flueway at least. In the exhaust gas purge of the internal combustion engine which prepared the 2nd catalyst which can adsorb a sulfur compound in the downstream rather than this 1st catalyst The secondary air supply means which can be supplied to a flueway is formed for the secondary air which purifies exhaust gas in the flueway between said 1st catalyst and 2nd catalyst. When a poisoning detection means to detect whether said 1st catalyst is carrying out poisoning with the sulfur compound is established and poisoning of the 1st catalyst is detected by this poisoning detection means, it is characterized by establishing the poisoning recovery control means which performs poisoning recovery control.
[0014] Moreover, it sets to the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the upstream rather than this 1st catalyst. An amount-of-adsorption judging means to

judge whether the amount of sulfur compounds in which said 2nd catalyst was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with this amount-of-adsorption judging means A judgment means is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst and the 2nd catalyst is over laying temperature]. When both the temperature of two catalysts is over laying temperature with the judgment means whenever [this catalyst temperature], it is characterized by establishing the poisoning recovery control means which performs poisoning recovery control of said 2nd catalyst.

[0015]

[Embodiment of the Invention] When the 1st catalyst recovers poisoning by the sulfur compound by having invented like ****, the sulfur compound emitted from the downstream of the 1st catalyst was adsorbed according to the 2nd catalyst located in the downstream, and it has prevented that a sulfur compound is emitted into atmospheric air.

[0016] Moreover, poisoning by the sulfur compound is certainly prevented according to the 2nd catalyst prepared in the flueway of the upstream rather than the 1st catalyst.

[0017]

[Example] Based on a drawing, the example of this invention is explained to a detail below.

[0018] Drawing 1 - drawing 4 show the 1st example of this invention. As for an internal combustion engine and 4, in drawing 2 , 2 is [an inhalation-of-air path and 6] flueways.

[0019] In said internal combustion engine's 2 inhalation-of-air system, while forming the throttle body 8 which has arranged the throttle valve which is not illustrated to the upstream, branching the inhalation-of-air path 4 of the downstream to four, corresponding to the number of gas columns and forming an injector 10 in each branching inhalation-of-air circulation space rather than this throttle body 8, respectively, an ignition plug 12 is arranged in each gas column upper part, respectively.

[0020] In said internal combustion engine's 2 exhaust air system, to moreover, the unification part of the branching flueway connected to each gas column While forming the 1st exhaust air sensor 14 which consists of an oxygen sensor, an air-fuel ratio sensor, or a nitrogen-oxides (NOx) sensor and forming the exhaust gas purge 16 in the flueway 6 of the downstream rather than this 1st exhaust air sensor 14 The 2nd exhaust air sensor 18 which consists of an oxygen sensor, an air-fuel ratio sensor, or a nitrogen-oxides (NOx) sensor is formed in the flueway 6 of the downstream rather than the exhaust gas purge 16.

[0021] At this time, said exhaust gas purge 16 has the 2nd catalyst 22 which is located in the downstream in nitrogen oxides at least rather than the 1st catalyst 20 in which adsorption or occlusion is possible, and this 1st catalyst 20, and can adsorb a sulfur compound.

[0022] And the secondary air supply means (it is also called a "secondary air feeder") 24 which can be supplied to a flueway 6 is formed for the secondary air which purifies exhaust gas in the flueway 6 between said 1st catalyst 20 and 2nd catalyst 22. A poisoning detection means 26 to detect whether said 1st catalyst 20 is carrying out

poisoning with the sulfur compound is established, and when poisoning of the 1st catalyst 20 is detected by this poisoning detection means 26, it considers as the configuration which establishes the poisoning recovery control means 28 which performs poisoning recovery control.

[0023] While forming the 1st temperature sensor 30 in said 1st catalyst 20 as shown in drawing 2 if it explains in full detail, the 2nd temperature sensor 32 is formed in said 2nd catalyst 22, and these 1st and 2nd temperature sensor 30 and 32 is connected and formed in the input section side of a control means (it is also called a "control unit") 34.

[0024] The 1st and 2nd exhaust air sensors 14 and 18 and a detection means (not shown) to, detect various sensors or engine rotation, a boost, throttle opening, the vehicle speed, water temperature, etc. in addition to this are connected to the input section side of this control means 34 besides the 1st and 2nd temperature sensor 30 and 32.

[0025] At this time, a poisoning detection means 26 to detect whether said 1st catalyst 20 is carrying out poisoning with the sulfur compound is constituted by the various sensor groups connected to the input section side of said control means 34.

[0026] In fact detection of whether the 1st catalyst 20 is carrying out poisoning with the sulfur compound with the poisoning detection means 26 (1) Reading value (2) engine rotation of the odometer which is not illustrated And the integral value of the timer which is not illustrated (3) Sulfur compound A sensor and nitrogen oxides (SOx) (NOx) The operating environment of said 1st catalyst 20 which is a catalyst de-activation detection (5) nitrogen-oxides (NOx) occlusion mold catalyst by the 1st exhaust air sensor 14 and the 2nd exhaust air sensor 18 of rear ****** which are the output-value (4) front of a sensor is performed using the integral value of the time amount which is 600 or less degrees etc.

[0027] Moreover, the ignition control unit (not shown) and the secondary air supply means 24 of controlling an injector 10 and an ignition plug 12 are connected to the output section side of said control means 34.

[0028] And in said control means 34, as shown in drawing 2 , the poisoning recovery control means 28 which performs poisoning recovery control is established.

[0029] This poisoning recovery control means 28 makes an air-fuel ratio rich at least, and performs poisoning recovery control of the 1st catalyst 20. That is, in fact, while making an air-fuel ratio rich, by the policy, such as carrying out lag control of an internal combustion engine's 2 ignition timing, for example, the temperature up of the 1st catalyst 20 is carried out to sulfur poisoning recovery temperature (for example, 600 degrees), and sulfur poisoning of the 1st catalyst 20 is recovered.

[0030] Moreover, a control signal is outputted to the secondary air supply means 24 by said poisoning recovery control means 28 from said control means 34, and it controls by it that secondary air should be supplied to the 2nd catalyst 22 with the secondary air supply means 24 at the same time it performs poisoning recovery control of the 1st catalyst 20. And a hydrogen sulfide is made into the condition which can be oxidized [adsorption or] by supplying secondary air.

[0031] At this time, only when judged with said secondary air supply means 24 having the sulfur adsorption capacity force in the 1st catalyst 20, secondary air is supplied to the

2nd catalyst 22. In addition, the amount of supply of secondary air can be set up in order to make it fluctuate according to the condition of the 1st catalyst 20.
[0032] Furthermore, said 1st catalyst 20 consists of a nitrogen-oxides (NOx) occlusion mold catalyst, and said 2nd catalyst 22 consists of a catalyst with which nickel or iron was supported at least.
[0033] Furthermore, when poisoning degradation of the 1st catalyst 20 is canceled by said poisoning recovery control means 28 again after performing poisoning recovery control of the 1st catalyst 20, sulfur purge control of the 2nd catalyst 22 is also performed.
[0034] In addition, considering as a three way component catalyst is also possible instead of making said 1st catalyst 20 into a nitrogen-oxides (NOx) occlusion mold catalyst.
[0035] Next, an operation is explained along with the flow chart for control of drawing 1 which made the 1st catalyst 20 the nitrogen-oxides (NOx) occlusion mold catalyst. In addition, in the flow chart for control of drawing 1 , "an upper catalyst" and the 2nd catalyst 22 are also called "down-stream catalyst" for the 1st catalyst 20.
[0036] If the program for control starts (102), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (104).
[0037] and judge whether the 1st catalyst 20 which is an upper catalyst is carrying out poisoning degradation (106), and when this decision (106) is NO Make it shift to the end (124) of the program for control then, and when decision (106) is YES While turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and a timer is started (108).
[0038] Moreover, while making a timer into an end (110) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, said secondary air supply means 24 is turned off, and supply for the 2nd catalyst 22 of secondary air is stopped (112).
[0039] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (114), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (116).
[0040] When this decision (116) is NO, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 Said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and when return and decision (116) are YES(s), while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst in the processing (108) which starts a timer, it is made to start a timer (118).
[0041] And a timer is made into an end (120) after progress of predetermined time, sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst is turned off (122),

and it is made to shift to the end (124) of the program for control.
[0042] Moreover, an operation is explained along with the flow chart for control of drawing 3 which made said 1st catalyst 20 the three way component catalyst.
[0043] If the program for control starts (202), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (204).
[0044] And it judges whether the 1st catalyst 20 which is an upper catalyst is carrying out poisoning degradation (206), when this decision (206) is NO, it is made to shift to the end (236) of the program for control as it is, and when decision (206) is YES, it judges whether the sulfur adsorption capacity force is in the 1st catalyst 20 which is an upper catalyst (208).
[0045] When this decision (208) is YES, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 turn on said secondary air supply means 24, supply secondary air to the 2nd catalyst 22, start a timer (210), and when decision (208) is NO A timer is started while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 (212).
[0046] Moreover, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 turn on said secondary air supply means 24, and secondary air is supplied to the 2nd catalyst 22. While making a timer into an end (214) after progress of predetermined time and turning off poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 from the processing (210) which starts a timer Said secondary air supply means 24 is turned off, and supply for the 2nd catalyst 22 of secondary air is stopped (216).
[0047] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (218), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (220).
[0048] When this decision (220) is NO, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 Said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and when return and decision (220) are YES(s), while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst in the processing (210) which starts a timer, it is made to start a timer (222).
[0049] Furthermore, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within the control means 34 mentioned above, a timer is made into an end (224) after the predetermined passage of time from the processing (212) which starts a timer, and poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 is turned off (226).
[0050] Then, various signals, such as engine rotation, a boost, throttle opening, the

vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (228), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (230).
[0051] A timer is started while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst mentioned above when return and decision (230) are YES(s) in the processing (212) which starts a timer while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, when this decision (230) is NO (222).
[0052] And a timer is made into an end (232) after progress of predetermined time, sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst is turned off (234), and it is made to shift to the end (236) of the program for control.
[0053] In drawing 4 , drawing showing the effectiveness at the time of using said exhaust gas purge 16 in this 1st example is indicated.
[0054] By this, the sulfur compound emitted from the downstream of the 1st catalyst 20 when said 1st catalyst 20 recovers poisoning by the sulfur compound can be adsorbed according to the 2nd catalyst 22 located in the downstream, and it can prevent that a sulfur compound is emitted into atmospheric air, and is advantageous practically.
[0055] In addition, by being carried out after the sulfur compound of the 1st catalyst 20 located in the upstream ****s, the desorption of the sulfur compound which stuck to the 2nd catalyst 22 can fully secure the sulfur adsorption engine performance of the 2nd catalyst 22, and can prevent discharge of a hydrogen sulfide.
[0056] Moreover, said poisoning recovery control means 28 can recover the 1st catalyst 20 from sulfur poisoning by making an air-fuel ratio rich at least, and performing poisoning recovery control of the 1st catalyst 20.
[0057] Furthermore, it is able for the sulfur compound emitted by poisoning recovery control from the 1st catalyst 20 to be able to prevent flowing into the 2nd catalyst 22 located in the downstream as it is, and to prevent beforehand degradation of the purification engine performance of the 2nd catalyst 22 by controlling with the secondary air supply means 24 that secondary air should be supplied to the 2nd catalyst 22 at the same time said poisoning recovery control means 28 performs poisoning recovery control of the 1st catalyst 20.
[0058] Furthermore, since the discharge of a sulfur compound decreases again when degradation of the 1st catalyst 20 progresses to some extent, by not performing secondary air supply control, only when judged with the sulfur adsorption capacity force being in the 1st catalyst 20 by said secondary air supply means 24, the function which supplies secondary air to the 2nd catalyst 22 is added to it, unnecessary control is avoided, and the dependability of control is raised.
[0059] Moreover, it is possible for sulfur purge control of the 2nd catalyst to be performed and to prevent emission of a sulfur compound certainly by said poisoning recovery control means 28, after poisoning recovery control of the 1st catalyst 20 is completely completed by performing sulfur purge control of the 2nd catalyst 22, when poisoning degradation of the 1st catalyst 20 is canceled after performing poisoning recovery control of the 1st catalyst 20.

[0060] Drawing 5 - drawing 7 show the 2nd example of this invention. The same sign is attached and explained to the part which achieves the same function as the thing of the 1st example of **** in this 2nd example.
[0061] The place by which it is characterized [of this 2nd example] is in the point which arranged the 2nd catalyst 302 in the flueway 6 of the upstream rather than the 1st catalyst 20.
[0062] That is, the 1st catalyst 20 which consists nitrogen oxides of a nitrogen-oxides (NOx) occlusion mold catalyst in which adsorption or occlusion is possible at least is formed in a flueway 6, and the 2nd catalyst 302 which can adsorb a sulfur compound is formed in the upstream rather than this 1st catalyst 20.
[0063] And an amount-of-adsorption judging means 304 to judge whether the amount of sulfur compounds in which said 2nd catalyst 302 was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with this amount-of-adsorption judging means 304 The judgment means 306 is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst 20 and the 2nd catalyst 302 is over laying temperature]. When both the temperature of the 1st and 2nd catalyst 20,302 which is two catalysts is over laying temperature with the judgment means 306 whenever [this catalyst temperature], it considers as the configuration which establishes the poisoning recovery control means 308 which performs poisoning recovery control of said 2nd catalyst 302.
[0064] Moreover, this poisoning recovery control means 308 makes an air-fuel ratio rich, and performs poisoning recovery control of the 2nd catalyst 302.
[0065] And an internal combustion engine's 2 exhaust gas purge 310 establishes a rise means (not shown) whenever [catalyst temperature / which is controlled in order to raise the temperature of a catalyst with low temperature], when [of the temperature of both the 1st catalyst 20 and the 2nd catalyst 302] either is lower than laying temperature at least.
[0066] As a rise means, the policy to which the temperature up of the 1st catalyst 20 or the 2nd catalyst 302 is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) by carrying out lag control of an internal combustion engine's 2 ignition timing, for example etc. can be considered whenever [this catalyst temperature].
[0067] Furthermore, only when judged with said poisoning recovery control means 308 having the sulfur adsorption capacity force of the 1st catalyst 20, poisoning recovery control of the 2nd catalyst 302 is performed.
[0068] Furthermore, said 2nd catalyst 302 consists of a catalyst with which nickel or iron was supported at least again.
[0069] The signs 30 of the 1st temperature sensor ("temperature sensor A" is said) and 32 are [the 2nd temperature sensor ("temperature sensor B" is said) and 34] control means.
[0070] In addition, considering as a three way component catalyst is also possible instead of making said 1st catalyst 20 into a nitrogen-oxides (NOx) occlusion mold catalyst.
[0071] Next, an operation is explained along with the flow chart for control of drawing 6 which made the 1st catalyst 20 the nitrogen-oxides (NOx) occlusion mold catalyst. In addition, in the flow chart for control of drawing 6 , a "down-stream catalyst" and the 2nd

catalyst 22 are also called "upper catalyst" for the 1st catalyst 20.
[0072] If the program for control starts (402), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (404).
[0073] and the sulfur amount of adsorption of the 2nd catalyst 302 which is an upper catalyst judges that it is size (406), and when this decision (406) is NO Make it shift to the end (428) of the program for control then, and when decision (406) is YES It is made to shift to decision (408) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0074] When this decision (408) is over 600 degrees whose temperature of both YES20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 Make an air-fuel ratio rich and it is made to shift to the processing (410) which starts a timer. When decision (408) is 600 or less degrees whose temperature of one catalyst of NO(s)20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on the catalyst temperature up control to which the temperature up of the catalyst with low temperature is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) in the 1st catalyst 20 or the 2nd catalyst 302 with a rise means, an air-fuel ratio is Lean-ized and it is made to shift to the processing (412) which starts a timer whenever [said catalyst temperature].
[0075] Moreover, a timer is made into an end (414) after processing (412) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery"). Catalyst temperature up control by the rise means is turned off whenever [said catalyst temperature] (416). After that, Various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (418). It returns to decision (408) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0076] While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within the control means 34 mentioned above After the processing (410) which an air-fuel ratio is made [processing] rich and starts a timer While making a timer into an end (420) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 An air-fuel ratio is Lean-ized and it considers as a SUTOIKI condition (422).
[0077] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (424), and the 2nd catalyst 302 which is an upper catalyst judges whether poisoning degradation was solved (426).
[0078] When return and decision (426) are YES(s), the end (428) of the program for

control is made to shift to decision (408) whether when this decision (426) is NO, 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0079] Moreover, an operation is explained along with the flow chart for control of drawing 7 which made said 1st catalyst 20 the three way component catalyst.
[0080] If the program for control starts (502), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (504).
[0081] And the sulfur amount of adsorption of the 2nd catalyst 302 which is an upper catalyst judges that it is size (506), when this decision (506) is NO, it is made to shift to the end (530) of the program for control as it is, and when decision (506) is YES, it is made to shift to decision (508) whether the sulfur adsorption capacity force is in the 1st catalyst 20 which is a down-stream catalyst.
[0082] It is made to shift to decision (510) whether when decision (508) was NO, it was made to shift to the end (530) of the program for control as it is, and 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature when decision (508) is YES were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0083] When this decision (510) is over 600 degrees whose temperature of both YES20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 Make an air-fuel ratio rich and it is made to shift to the processing (512) which starts a timer. When decision (510) is 600 or less degrees whose temperature of one catalyst of NO(s)20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on the catalyst temperature up control to which the temperature up of the catalyst with low temperature is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) in the 1st catalyst 20 or the 2nd catalyst 302 with a rise means, an air-fuel ratio is Lean-ized and it is made to shift to the processing (514) which starts a timer whenever [said catalyst temperature].
[0084] Moreover, a timer is made into an end (516) after processing (514) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery"). Catalyst temperature up control by the rise means is turned off whenever [said catalyst temperature] (518). After that, Various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (520). It returns to decision (510) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0085] While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within the control means 34 mentioned above After the processing (512) which an air-fuel ratio is made [processing] rich and starts a timer While making a timer into an end (522) after progress of

predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 An air-fuel ratio is Lean-ized and it considers as a SUTOIKI condition (524).
[0086] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (526), and the 2nd catalyst 302 which is an upper catalyst judges whether poisoning degradation was solved (528).
[0087] When return and decision (528) are YES(s), the end (530) of the program for control is made to shift to decision (510) whether when this decision (528) is NO, 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0088] This becomes possible from said 1st catalyst 20 to prevent poisoning by the sulfur compound certainly according to the 2nd catalyst 302 prepared in the flueway 6 of the upstream.
[0089] Moreover, said poisoning recovery control means 308 can recover the 2nd catalyst 302 from sulfur poisoning by making an air-fuel ratio rich and performing poisoning recovery control of the 2nd catalyst 302.
[0090] Furthermore, an internal combustion engine's 2 exhaust gas purge 310 When [of the temperature of both the 1st catalyst 20 and the 2nd catalyst 302] either is lower than laying temperature at least, whenever [catalyst temperature] with a rise means (not shown) By controlling in order to raise the temperature of a catalyst with low temperature, only when the temperature of a catalyst exceeds laying temperature, poisoning recovery control will be performed, and discharge of a sulfur compound can be prevented certainly.
[0091] furthermore, when degradation of the 1st catalyst 20 progresses to some extent, again By not performing poisoning recovery control of the 2nd catalyst 302 located in the upstream, since the discharge of a sulfur compound decreases Only when judged with the sulfur adsorption capacity force being in the 1st catalyst 20 by said poisoning recovery control means 308, the function to perform poisoning recovery control of the 2nd catalyst 302 is added to it, unnecessary control is avoided, and the dependability of control is raised.
[0092] In addition, this invention is not limited to the 1st and 2nd examples of ****, and various application alterations are possible for it.
[0093] For example, in the 1st and 2nd examples of this invention, although nitrogen oxides were considered as one configuration which arranges at least a total of two catalysts of the 1st catalyst in which adsorption or occlusion is possible, and the 2nd catalyst which can adsorb one sulfur compound and were carried out, it is also possible to consider as the special configuration which arranges three or more catalysts.
[0094] That is, in case three catalysts are arranged, for example, the 3rd catalyst which can adsorb a sulfur compound is arranged in the upstream of the 1st catalyst in the arrangement condition of the 1st and 2nd catalyst indicated by the 1st example.

[0095] If it strokes, while being able to insert the upstream and the downstream of the 1st catalyst according to the 3rd catalyst and the 2nd catalyst which can adsorb a sulfur compound and being able to prevent poisoning by the sulfur compound of the 1st catalyst certainly according to the 3rd catalyst By the degradation of the 3rd catalyst etc., when poisoning of the 1st catalyst is carried out by the sulfur compound, the sulfur compound emitted from the downstream of the 1st catalyst should be adsorbed according to the 2nd catalyst located in the downstream, and it should prevent that a sulfur compound is emitted into atmospheric air.
[0096]
[Effect of the Invention] As explained to the detail above, according to this this invention, the 1st catalyst in which adsorption or occlusion is possible is prepared for nitrogen oxides in a flueway at least. In the exhaust gas purge of the internal combustion engine which prepared the 2nd catalyst which can adsorb a sulfur compound in the downstream rather than the 1st catalyst The secondary air supply means which can be supplied to a flueway is formed for the secondary air which purifies exhaust gas in the flueway between the 1st catalyst and the 2nd catalyst. Since a poisoning detection means to detect whether the 1st catalyst is carrying out poisoning with the sulfur compound was established, and the poisoning recovery control means which performs poisoning recovery control was established when poisoning of the 1st catalyst was detected by the poisoning detection means When said 1st catalyst recovers poisoning by the sulfur compound, the sulfur compound emitted from the downstream of the 1st catalyst can be adsorbed according to the 2nd catalyst located in the downstream, and it can prevent that a sulfur compound is emitted into atmospheric air.
[0097] Moreover, it sets to the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the upstream rather than the 1st catalyst. An amount-of-adsorption judging means to judge whether the amount of sulfur compounds in which the 2nd catalyst was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with the amount-of-adsorption judging means A judgment means is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst and the 2nd catalyst is over laying temperature]. Since the poisoning recovery control means which performs poisoning recovery control of the 2nd catalyst was established when both the temperature of two catalysts was over laying temperature with the judgment means whenever [catalyst temperature] It is more possible than said 1st catalyst to prevent poisoning by the sulfur compound of the 1st catalyst certainly according to the 2nd catalyst prepared in the flueway of the upstream.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] As explained to the detail above, according to this this invention, the 1st catalyst in which adsorption or occlusion is possible is prepared for nitrogen oxides in a flueway at least. In the exhaust gas purge of the internal combustion engine which prepared the 2nd catalyst which can adsorb a sulfur compound in the downstream rather than the 1st catalyst The secondary air supply means which can be supplied to a flueway is formed for the secondary air which purifies exhaust gas in the flueway between the 1st catalyst and the 2nd catalyst. Since a poisoning detection means to detect whether the 1st catalyst is carrying out poisoning with the sulfur compound was established, and the poisoning recovery control means which performs poisoning recovery control was established when poisoning of the 1st catalyst was detected by the poisoning detection means When said 1st catalyst recovers poisoning by the sulfur compound, the sulfur compound emitted from the downstream of the 1st catalyst can be adsorbed according to the 2nd catalyst located in the downstream, and it can prevent that a sulfur compound is emitted into atmospheric air.
[0097] Moreover, it sets to the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the upstream rather than the 1st catalyst. An amount-of-adsorption judging means to judge whether the amount of sulfur compounds in which the 2nd catalyst was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with the amount-of-adsorption judging means A judgment means is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst and the 2nd catalyst is over laying temperature]. Since the poisoning recovery control means which performs poisoning recovery control of the 2nd catalyst was established when both the temperature of two catalysts was over laying temperature with the judgment means whenever [catalyst temperature] It is more possible than said 1st catalyst to prevent poisoning by the sulfur compound of the 1st catalyst certainly according to the 2nd catalyst prepared in the flueway of the upstream.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in the conventional internal combustion engine's exhaust gas purge, the catalyst for exhaust gas purification adsorbed the sulfur compound in exhaust gas (SOx, H2S) etc., and has caused the degradation by sulfur poisoning.
[0008] Especially, many policies from which the effect by sulfur poisoning is serious, and protects sulfur poisoning are worked on by the nitrogen-oxides (NOx) occlusion mold catalyst (for example, JP,7-217474,A etc.).
[0009] And the sulfur which stuck to the catalyst is removed, that is, in case a catalyst is recovered from sulfur poisoning, it is required to carry out a catalyst to beyond sulfur desorption temperature (for example, 600 degrees), and to make an air-fuel ratio rich.
[0010] Since the sulfur to which it was sticking serves as a hydrogen sulfide (H2S) at this time and it is emitted, there is un-arranging [that sulfurous odour occurs from a tail pipe].
[0011] moreover -- although there are some which perform purge control after sulfur poisoning of a catalyst in other patent application -- this patent application -- a nitrogen-oxides (NOx) occlusion mold catalyst -- it can be comparatively desorbed only from a surface part.
[0012] However, there is un-arranging [that the desorption of the deep part of a catalyst bed is difficult, and recovery from sulfur poisoning cannot fully be performed].

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MEANS

[Means for Solving the Problem] Then, in order that this invention may remove un-[above-mentioned] arranging, the 1st catalyst in which adsorption or occlusion is possible is prepared for nitrogen oxides in a flueway at least. In the exhaust gas purge of the internal combustion engine which prepared the 2nd catalyst which can adsorb a sulfur compound in the downstream rather than this 1st catalyst The secondary air supply means which can be supplied to a flueway is formed for the secondary air which purifies exhaust gas in the flueway between said 1st catalyst and 2nd catalyst. When a poisoning detection means to detect whether said 1st catalyst is carrying out poisoning with the sulfur compound is established and poisoning of the 1st catalyst is detected by this poisoning detection means, it is characterized by establishing the poisoning recovery control means which performs poisoning recovery control.
[0014] Moreover, it sets to the exhaust gas purge of the internal combustion engine which prepared at least the 1st catalyst in which adsorption or occlusion is possible for nitrogen oxides in the flueway, and prepared the 2nd catalyst which can adsorb a sulfur compound in the upstream rather than this 1st catalyst. An amount-of-adsorption judging means to judge whether the amount of sulfur compounds in which said 2nd catalyst was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with this amount-of-adsorption judging means A judgment means is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst and the 2nd catalyst is over laying temperature]. When both the temperature of two catalysts is over laying temperature with the judgment means whenever [this catalyst temperature], it is characterized by establishing the poisoning recovery control means which performs poisoning recovery control of said 2nd catalyst.
[0015]
[Embodiment of the Invention] When the 1st catalyst recovers poisoning by the sulfur compound by having invented like ****, the sulfur compound emitted from the downstream of the 1st catalyst was adsorbed according to the 2nd catalyst located in the downstream, and it has prevented that a sulfur compound is emitted into atmospheric air.
[0016] Moreover, poisoning by the sulfur compound is certainly prevented according to the 2nd catalyst prepared in the flueway of the upstream rather than the 1st catalyst.

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EXAMPLE

[Example] Based on a drawing, the example of this invention is explained to a detail below.
[0018] Drawing 1 - drawing 4 show the 1st example of this invention. As for an internal combustion engine and 4, in drawing 2 , 2 is [an inhalation-of-air path and 6] flueways.
[0019] In said internal combustion engine's 2 inhalation-of-air system, while forming the throttle body 8 which has arranged the throttle valve which is not illustrated to the upstream, branching the inhalation-of-air path 4 of the downstream to four, corresponding to the number of gas columns and forming an injector 10 in each branching inhalation-of-air circulation space rather than this throttle body 8, respectively, an ignition plug 12 is arranged in each gas column upper part, respectively.
[0020] In said internal combustion engine's 2 exhaust air system, to moreover, the unification part of the branching flueway connected to each gas column While forming the 1st exhaust air sensor 14 which consists of an oxygen sensor, an air-fuel ratio sensor, or a nitrogen-oxides (NOx) sensor and forming the exhaust gas purge 16 in the flueway 6 of the downstream rather than this 1st exhaust air sensor 14 The 2nd exhaust air sensor 18 which consists of an oxygen sensor, an air-fuel ratio sensor, or a nitrogen-oxides (NOx) sensor is formed in the flueway 6 of the downstream rather than the exhaust gas purge 16.

[0021] At this time, said exhaust gas purge 16 has the 2nd catalyst 22 which is located in the downstream in nitrogen oxides at least rather than the 1st catalyst 20 in which adsorption or occlusion is possible, and this 1st catalyst 20, and can adsorb a sulfur compound.
[0022] And the secondary air supply means (it is also called a "secondary air feeder") 24 which can be supplied to a flueway 6 is formed for the secondary air which purifies exhaust gas in the flueway 6 between said 1st catalyst 20 and 2nd catalyst 22. A poisoning detection means 26 to detect whether said 1st catalyst 20 is carrying out poisoning with the sulfur compound is established, and when poisoning of the 1st catalyst 20 is detected by this poisoning detection means 26, it considers as the configuration which establishes the poisoning recovery control means 28 which performs poisoning recovery control.
[0023] While forming the 1st temperature sensor 30 in said 1st catalyst 20 as shown in

drawing 2 if it explains in full detail, the 2nd temperature sensor 32 is formed in said 2nd catalyst 22, and these 1st and 2nd temperature sensor 30 and 32 is connected and formed in the input section side of a control means (it is also called a "control unit") 34.
[0024] The 1st and 2nd exhaust air sensors 14 and 18 and a detection means (not shown) to, detect various sensors or engine rotation, a boost, throttle opening, the vehicle speed, water temperature, etc. in addition to this are connected to the input section side of this control means 34 besides the 1st and 2nd temperature sensor 30 and 32.
[0025] At this time, a poisoning detection means 26 to detect whether said 1st catalyst 20 is carrying out poisoning with the sulfur compound is constituted by the various sensor groups connected to the input section side of said control means 34.
[0026] In fact detection of whether the 1st catalyst 20 is carrying out poisoning with the sulfur compound with the poisoning detection means 26 (1) Reading value (2) engine rotation of the odometer which is not illustrated And the integral value of the timer which is not illustrated (3) Sulfur compound A sensor and nitrogen oxides (SOx) (NOx) The operating environment of said 1st catalyst 20 which is a catalyst de-activation detection (5) nitrogen-oxides (NOx) occlusion mold catalyst by the 1st exhaust air sensor 14 and the 2nd exhaust air sensor 18 of rear ****** which are the output-value (4) front of a sensor is performed using the integral value of the time amount which is 600 or less degrees etc.
[0027] Moreover, the ignition control unit (not shown) and the secondary air supply means 24 of controlling an injector 10 and an ignition plug 12 are connected to the output section side of said control means 34.
[0028] And in said control means 34, as shown in drawing 2 , the poisoning recovery control means 28 which performs poisoning recovery control is established.
[0029] This poisoning recovery control means 28 makes an air-fuel ratio rich at least, and performs poisoning recovery control of the 1st catalyst 20. That is, in fact, while making an air-fuel ratio rich, by the policy, such as carrying out lag control of an internal combustion engine's 2 ignition timing, for example, the temperature up of the 1st catalyst 20 is carried out to sulfur poisoning recovery temperature (for example, 600 degrees), and sulfur poisoning of the 1st catalyst 20 is recovered.
[0030] Moreover, a control signal is outputted to the secondary air supply means 24 by said poisoning recovery control means 28 from said control means 34, and it controls by it that secondary air should be supplied to the 2nd catalyst 22 with the secondary air supply means 24 at the same time it performs poisoning recovery control of the 1st catalyst 20. And a hydrogen sulfide is made into the condition which can be oxidized [adsorption or] by supplying secondary air.
[0031] At this time, only when judged with said secondary air supply means 24 having the sulfur adsorption capacity force in the 1st catalyst 20, secondary air is supplied to the 2nd catalyst 22. In addition, the amount of supply of secondary air can be set up in order to make it fluctuate according to the condition of the 1st catalyst 20.
[0032] Furthermore, said 1st catalyst 20 consists of a nitrogen-oxides (NOx) occlusion mold catalyst, and said 2nd catalyst 22 consists of a catalyst with which nickel or iron was supported at least.

[0033] Furthermore, when poisoning degradation of the 1st catalyst 20 is canceled by said poisoning recovery control means 28 again after performing poisoning recovery control of the 1st catalyst 20, sulfur purge control of the 2nd catalyst 22 is also performed.
[0034] In addition, considering as a three way component catalyst is also possible instead of making said 1st catalyst 20 into a nitrogen-oxides (NOx) occlusion mold catalyst.
[0035] Next, an operation is explained along with the flow chart for control of drawing 1 which made the 1st catalyst 20 the nitrogen-oxides (NOx) occlusion mold catalyst. In addition, in the flow chart for control of drawing 1 , "an upper catalyst" and the 2nd catalyst 22 are also called "down-stream catalyst" for the 1st catalyst 20.
[0036] If the program for control starts (102), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (104).
[0037] and judge whether the 1st catalyst 20 which is an upper catalyst is carrying out poisoning degradation (106), and when this decision (106) is NO Make it shift to the end (124) of the program for control then, and when decision (106) is YES While turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and a timer is started (108).
[0038] Moreover, while making a timer into an end (110) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, said secondary air supply means 24 is turned off, and supply for the 2nd catalyst 22 of secondary air is stopped (112).
[0039] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (114), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (116).
[0040] When this decision (116) is NO, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 Said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and when return and decision (116) are YES(s), while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst in the processing (108) which starts a timer, it is made to start a timer (118).
[0041] And a timer is made into an end (120) after progress of predetermined time, sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst is turned off (122), and it is made to shift to the end (124) of the program for control.
[0042] Moreover, an operation is explained along with the flow chart for control of drawing 3 which made said 1st catalyst 20 the three way component catalyst.
[0043] If the program for control starts (202), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18,

and an odometer, will be incorporated by the control means 34 (204).
[0044] And it judges whether the 1st catalyst 20 which is an upper catalyst is carrying out poisoning degradation (206), when this decision (206) is NO, it is made to shift to the end (236) of the program for control as it is, and when decision (206) is YES, it judges whether the sulfur adsorption capacity force is in the 1st catalyst 20 which is an upper catalyst (208).
[0045] When this decision (208) is YES, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 turn on said secondary air supply means 24, supply secondary air to the 2nd catalyst 22, start a timer (210), and when decision (208) is NO A timer is started while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 (212).
[0046] Moreover, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 turn on said secondary air supply means 24, and secondary air is supplied to the 2nd catalyst 22. While making a timer into an end (214) after progress of predetermined time and turning off poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 from the processing (210) which starts a timer Said secondary air supply means 24 is turned off, and supply for the 2nd catalyst 22 of secondary air is stopped (216).
[0047] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (218), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (220).
[0048] When this decision (220) is NO, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 Said secondary air supply means 24 is turned on, secondary air is supplied to the 2nd catalyst 22, and when return and decision (220) are YES(s), while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst in the processing (210) which starts a timer, it is made to start a timer (222).
[0049] Furthermore, while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within the control means 34 mentioned above, a timer is made into an end (224) after the predetermined passage of time from the processing (212) which starts a timer, and poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34 is turned off (226).
[0050] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (228), and the 1st catalyst 20 which is an upper catalyst judges whether poisoning degradation was solved (230).
[0051] A timer is started while turning on sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst mentioned above when return and decision (230) are

YES(s) in the processing (212) which starts a timer while turning on poisoning recovery control of the 1st catalyst 20 which is an upper catalyst by the poisoning recovery control means 28 within a control means 34, when this decision (230) is NO (222).
[0052] And a timer is made into an end (232) after progress of predetermined time, sulfur purge control of the 2nd catalyst 22 which is a down-stream catalyst is turned off (234), and it is made to shift to the end (236) of the program for control.
[0053] In drawing 4 , drawing showing the effectiveness at the time of using said exhaust gas purge 16 in this 1st example is indicated.
[0054] By this, the sulfur compound emitted from the downstream of the 1st catalyst 20 when said 1st catalyst 20 recovers poisoning by the sulfur compound can be adsorbed according to the 2nd catalyst 22 located in the downstream, and it can prevent that a sulfur compound is emitted into atmospheric air, and is advantageous practically.
[0055] In addition, by being carried out after the sulfur compound of the 1st catalyst 20 located in the upstream ****s, the desorption of the sulfur compound which stuck to the 2nd catalyst 22 can fully secure the sulfur adsorption engine performance of the 2nd catalyst 22, and can prevent discharge of a hydrogen sulfide.
[0056] Moreover, said poisoning recovery control means 28 can recover the 1st catalyst 20 from sulfur poisoning by making an air-fuel ratio rich at least, and performing poisoning recovery control of the 1st catalyst 20.
[0057] Furthermore, it is able for the sulfur compound emitted by poisoning recovery control from the 1st catalyst 20 to be able to prevent flowing into the 2nd catalyst 22 located in the downstream as it is, and to prevent beforehand degradation of the purification engine performance of the 2nd catalyst 22 by controlling with the secondary air supply means 24 that secondary air should be supplied to the 2nd catalyst 22 at the same time said poisoning recovery control means 28 performs poisoning recovery control of the 1st catalyst 20.
[0058] Furthermore, since the discharge of a sulfur compound decreases again when degradation of the 1st catalyst 20 progresses to some extent, by not performing secondary air supply control, only when judged with the sulfur adsorption capacity force being in the 1st catalyst 20 by said secondary air supply means 24, the function which supplies secondary air to the 2nd catalyst 22 is added to it, unnecessary control is avoided, and the dependability of control is raised.
[0059] Moreover, it is possible for sulfur purge control of the 2nd catalyst to be performed and to prevent emission of a sulfur compound certainly by said poisoning recovery control means 28, after poisoning recovery control of the 1st catalyst 20 is completely completed by performing sulfur purge control of the 2nd catalyst 22, when poisoning degradation of the 1st catalyst 20 is canceled after performing poisoning recovery control of the 1st catalyst 20.
[0060] Drawing 5 - drawing 7 show the 2nd example of this invention. The same sign is attached and explained to the part which achieves the same function as the thing of the 1st example of **** in this 2nd example.
[0061] The place by which it is characterized [of this 2nd example] is in the point which arranged the 2nd catalyst 302 in the flueway 6 of the upstream rather than the 1st catalyst

20.
[0062] That is, the 1st catalyst 20 which consists nitrogen oxides of a nitrogen-oxides (NOx) occlusion mold catalyst in which adsorption or occlusion is possible at least is formed in a flueway 6, and the 2nd catalyst 302 which can adsorb a sulfur compound is formed in the upstream rather than this 1st catalyst 20.
[0063] And an amount-of-adsorption judging means 304 to judge whether the amount of sulfur compounds in which said 2nd catalyst 302 was adsorbed is over the amount of setup is established. When it is judged that the amount of sulfur compounds exceeded the amount of setup with this amount-of-adsorption judging means 304 The judgment means 306 is established whenever [catalyst temperature / which judges whether the temperature of both the 1st catalyst 20 and the 2nd catalyst 302 is over laying temperature]. When both the temperature of the 1st and 2nd catalyst 20,302 which is two catalysts is over laying temperature with the judgment means 306 whenever [this catalyst temperature], it considers as the configuration which establishes the poisoning recovery control means 308 which performs poisoning recovery control of said 2nd catalyst 302.
[0064] Moreover, this poisoning recovery control means 308 makes an air-fuel ratio rich, and performs poisoning recovery control of the 2nd catalyst 302.
[0065] And an internal combustion engine's 2 exhaust gas purge 310 establishes a rise means (not shown) whenever [catalyst temperature / which is controlled in order to raise the temperature of a catalyst with low temperature], when [of the temperature of both the 1st catalyst 20 and the 2nd catalyst 302] either is lower than laying temperature at least.
[0066] As a rise means, the policy to which the temperature up of the 1st catalyst 20 or the 2nd catalyst 302 is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) by carrying out lag control of an internal combustion engine's 2 ignition timing, for example etc. can be considered whenever [this catalyst temperature].
[0067] Furthermore, only when judged with said poisoning recovery control means 308 having the sulfur adsorption capacity force of the 1st catalyst 20, poisoning recovery control of the 2nd catalyst 302 is performed.
[0068] Furthermore, said 2nd catalyst 302 consists of a catalyst with which nickel or iron was supported at least again.
[0069] The signs 30 of the 1st temperature sensor ("temperature sensor A" is said) and 32 are [the 2nd temperature sensor ("temperature sensor B" is said) and 34] control means.
[0070] In addition, considering as a three way component catalyst is also possible instead of making said 1st catalyst 20 into a nitrogen-oxides (NOx) occlusion mold catalyst.
[0071] Next, an operation is explained along with the flow chart for control of drawing 6 which made the 1st catalyst 20 the nitrogen-oxides (NOx) occlusion mold catalyst. In addition, in the flow chart for control of drawing 6 , a "down-stream catalyst" and the 2nd catalyst 22 are also called "upper catalyst" for the 1st catalyst 20.
[0072] If the program for control starts (402), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (404).
[0073] and the sulfur amount of adsorption of the 2nd catalyst 302 which is an upper

catalyst judges that it is size (406), and when this decision (406) is NO Make it shift to the end (428) of the program for control then, and when decision (406) is YES It is made to shift to decision (408) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0074] When this decision (408) is over 600 degrees whose temperature of both YES20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 Make an air-fuel ratio rich and it is made to shift to the processing (410) which starts a timer. When decision (408) is 600 or less degrees whose temperature of one catalyst of NO(s)20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on the catalyst temperature up control to which the temperature up of the catalyst with low temperature is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) in the 1st catalyst 20 or the 2nd catalyst 302 with a rise means, an air-fuel ratio is Lean-ized and it is made to shift to the processing (412) which starts a timer whenever [said catalyst temperature].
[0075] Moreover, a timer is made into an end (414) after processing (412) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery"). Catalyst temperature up control by the rise means is turned off whenever [said catalyst temperature] (416). After that, Various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (418). It returns to decision (408) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0076] While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within the control means 34 mentioned above After the processing (410) which an air-fuel ratio is made [processing] rich and starts a timer While making a timer into an end (420) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 An air-fuel ratio is Lean-ized and it considers as a SUTOIKI condition (422).
[0077] Then, various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (424), and the 2nd catalyst 302 which is an upper catalyst judges whether poisoning degradation was solved (426).
[0078] When return and decision (426) are YES(s), the end (428) of the program for control is made to shift to decision (408) whether when this decision (426) is NO, 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0079] Moreover, an operation is explained along with the flow chart for control of

drawing 7 which made said 1st catalyst 20 the three way component catalyst.
[0080] If the program for control starts (502), various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, will be incorporated by the control means 34 (504).
[0081] And the sulfur amount of adsorption of the 2nd catalyst 302 which is an upper catalyst judges that it is size (506), when this decision (506) is NO, it is made to shift to the end (530) of the program for control as it is, and when decision (506) is YES, it is made to shift to decision (508) whether the sulfur adsorption capacity force is in the 1st catalyst 20 which is a down-stream catalyst.
[0082] It is made to shift to decision (510) whether when decision (508) was NO, it was made to shift to the end (530) of the program for control as it is, and 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature when decision (508) is YES were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0083] When this decision (510) is over 600 degrees whose temperature of both YES20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 Make an air-fuel ratio rich and it is made to shift to the processing (512) which starts a timer. When decision (510) is 600 or less degrees whose temperature of one catalyst of NO(s)20,302, i.e., the 1st and 2nd catalyst, is laying temperature While turning on the catalyst temperature up control to which the temperature up of the catalyst with low temperature is carried out to sulfur poisoning recovery temperature (for example, 600 degrees) in the 1st catalyst 20 or the 2nd catalyst 302 with a rise means, an air-fuel ratio is Lean-ized and it is made to shift to the processing (514) which starts a timer whenever [said catalyst temperature].
[0084] Moreover, a timer is made into an end (516) after processing (514) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery"). Catalyst temperature up control by the rise means is turned off whenever [said catalyst temperature] (518). After that, Various signals, such as engine rotation, a boost, throttle opening, the vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (520). It returns to decision (510) whether 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0085] While turning on poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within the control means 34 mentioned above After the processing (512) which an air-fuel ratio is made [processing] rich and starts a timer While making a timer into an end (522) after progress of predetermined time (it can put in another way with "time amount required for poisoning recovery") and turning off poisoning recovery control of the 2nd catalyst 302 which is an upper catalyst by the poisoning recovery control means 308 within a control means 34 An air-fuel ratio is Lean-ized and it considers as a SUTOIKI condition (524).
[0086] Then, various signals, such as engine rotation, a boost, throttle opening, the

vehicle speed, the 1st and 2nd exhaust air sensors 14 and 18, and an odometer, are incorporated to a control means 34 (526), and the 2nd catalyst 302 which is an upper catalyst judges whether poisoning degradation was solved (528).
[0087] When return and decision (528) are YES(s), the end (530) of the program for control is made to shift to decision (510) whether when this decision (528) is NO, 600 degrees whose 1st temperature sensor 30 which is temperature sensor A is laying temperature were exceeded, and it is over 600 degrees whose 2nd temperature sensor 32 which is temperature sensor B is laying temperature.
[0088] This becomes possible from said 1st catalyst 20 to prevent poisoning by the sulfur compound certainly according to the 2nd catalyst 302 prepared in the flueway 6 of the upstream.
[0089] Moreover, said poisoning recovery control means 308 can recover the 2nd catalyst 302 from sulfur poisoning by making an air-fuel ratio rich and performing poisoning recovery control of the 2nd catalyst 302.
[0090] Furthermore, an internal combustion engine's 2 exhaust gas purge 310 When [of the temperature of both the 1st catalyst 20 and the 2nd catalyst 302] either is lower than laying temperature at least, whenever [catalyst temperature] with a rise means (not shown) By controlling in order to raise the temperature of a catalyst with low temperature, only when the temperature of a catalyst exceeds laying temperature, poisoning recovery control will be performed, and discharge of a sulfur compound can be prevented certainly.
[0091] furthermore, when degradation of the 1st catalyst 20 progresses to some extent, again By not performing poisoning recovery control of the 2nd catalyst 302 located in the upstream, since the discharge of a sulfur compound decreases Only when judged with the sulfur adsorption capacity force being in the 1st catalyst 20 by said poisoning recovery control means 308, the function to perform poisoning recovery control of the 2nd catalyst 302 is added to it, unnecessary control is avoided, and the dependability of control is raised.
[0092] In addition, this invention is not limited to the 1st and 2nd examples of ****, and various application alterations are possible for it.
[0093] For example, in the 1st and 2nd examples of this invention, although nitrogen oxides were considered as one configuration which arranges at least a total of two catalysts of the 1st catalyst in which adsorption or occlusion is possible, and the 2nd catalyst which can adsorb one sulfur compound and were carried out, it is also possible to consider as the special configuration which arranges three or more catalysts.
[0094] That is, in case three catalysts are arranged, for example, the 3rd catalyst which can adsorb a sulfur compound is arranged in the upstream of the 1st catalyst in the arrangement condition of the 1st and 2nd catalyst indicated by the 1st example.
[0095] If it strokes, while being able to insert the upstream and the downstream of the 1st catalyst according to the 3rd catalyst and the 2nd catalyst which can adsorb a sulfur compound and being able to prevent poisoning by the sulfur compound of the 1st catalyst certainly according to the 3rd catalyst By the degradation of the 3rd catalyst etc., when poisoning of the 1st catalyst is carried out by the sulfur compound, the sulfur compound

emitted from the downstream of the 1st catalyst should be adsorbed according to the 2nd catalyst located in the downstream, and it should prevent that a sulfur compound is emitted into atmospheric air.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flow chart for control which made the 1st catalyst which shows the 1st example of this invention the nitrogen-oxides (NOx) occlusion mold catalyst.
[Drawing 2] It is the outline block diagram of an internal combustion engine's exhaust gas purge.
[Drawing 3] It is the flow chart for control which made the 1st catalyst the three way component catalyst.
[Drawing 4] It is drawing showing the amount of hydrogen-sulfide (H2S) detection, and elapsed time.
[Drawing 5] It is the flow chart for control which made the 1st catalyst which shows the 2nd example of this invention the nitrogen-oxides (NOx) occlusion mold catalyst.
[Drawing 6] It is the outline block diagram of an internal combustion engine's exhaust gas purge.
[Drawing 7] It is the flow chart for control which made the 1st catalyst the three way component catalyst.
[Description of Notations]
2 Internal Combustion Engine
4 Inhalation-of-Air Path
6 Flueway
8 Throttle Body
10 Injector
12 Ignition Plug
14 1st Exhaust Air Sensor
16 Exhaust Gas Purge
18 2nd Exhaust Air Sensor
20 1st Catalyst
22 2nd Catalyst
24 Secondary Air Supply Means (it is Also Called "Secondary Air Feeder")
26 Poisoning Detection Means
28 Poisoning Recovery Control Means
30 1st Temperature Sensor

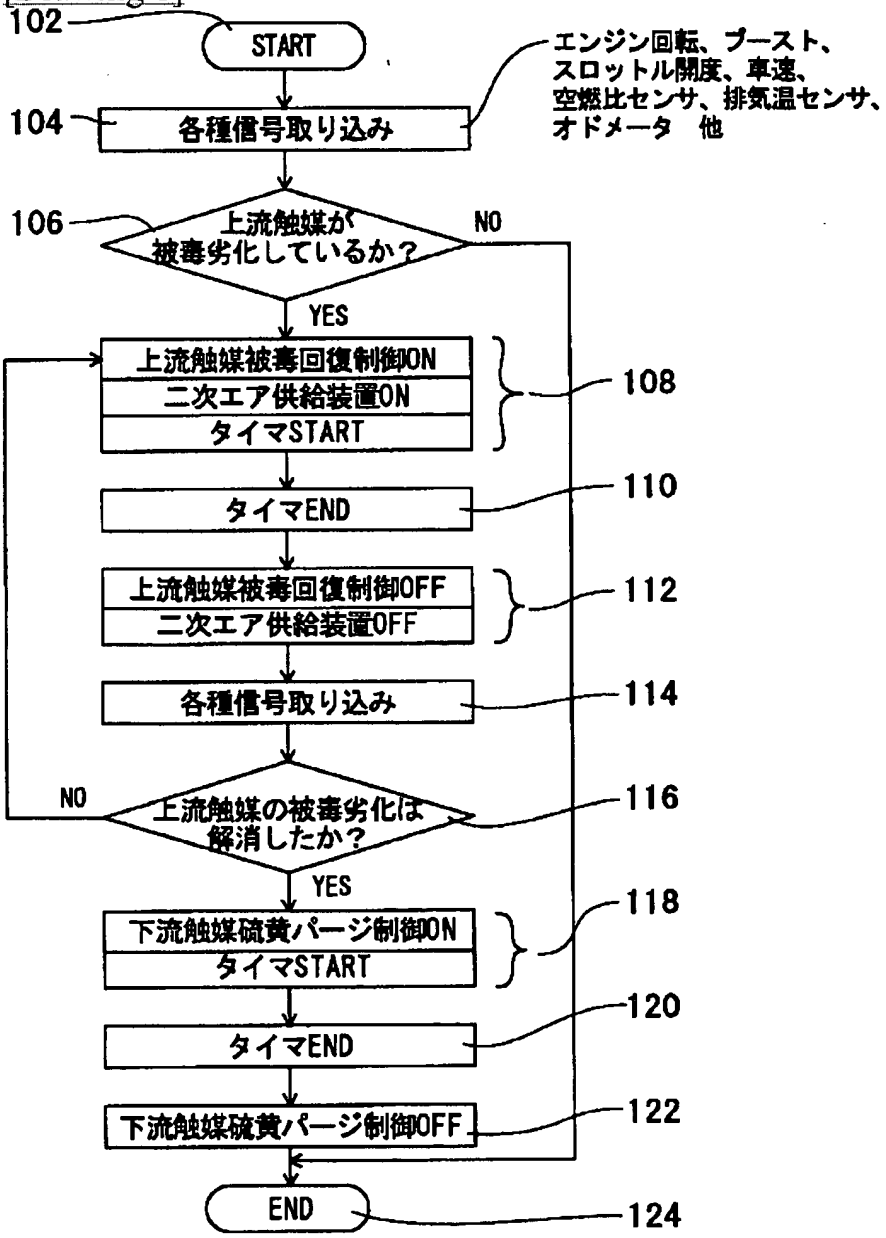
32 2nd Temperature Sensor
34 Control Means (it is Also Called "Control Unit")

[Translation done.]

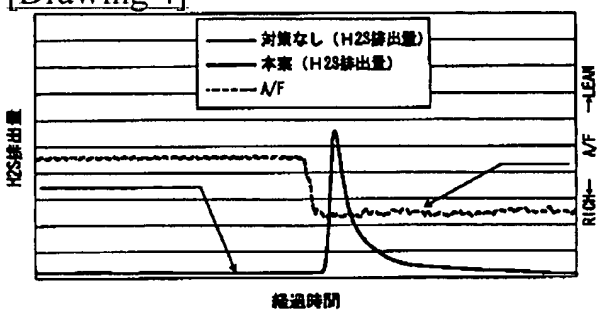
* NOTICES *

DRAWINGS

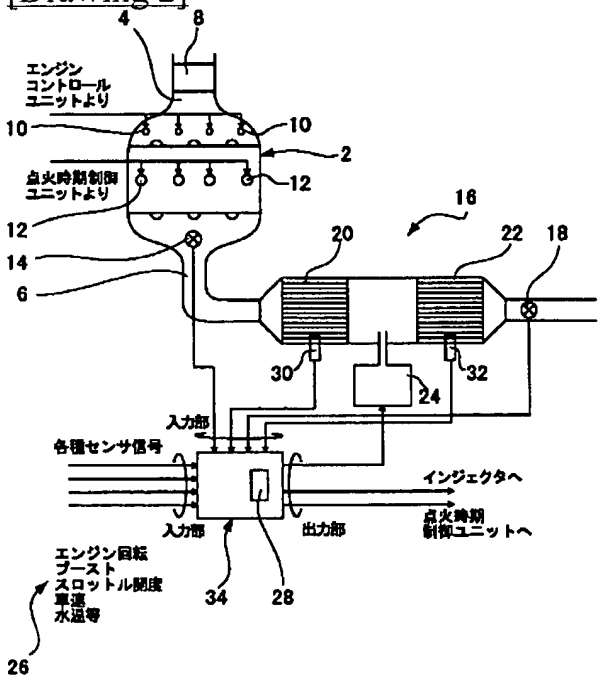
[Drawing 1]



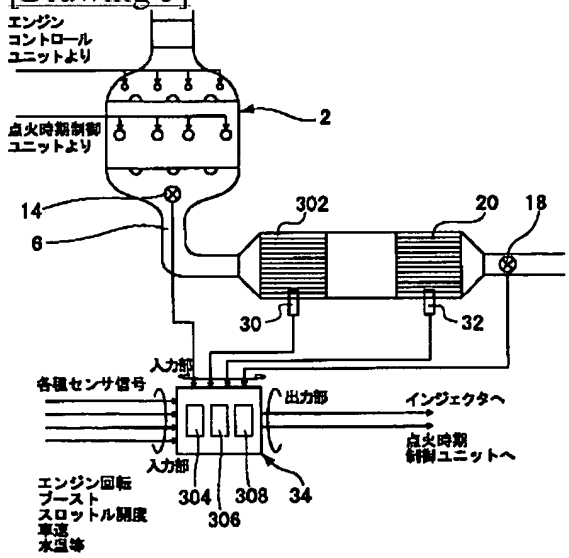
[Drawing 4]



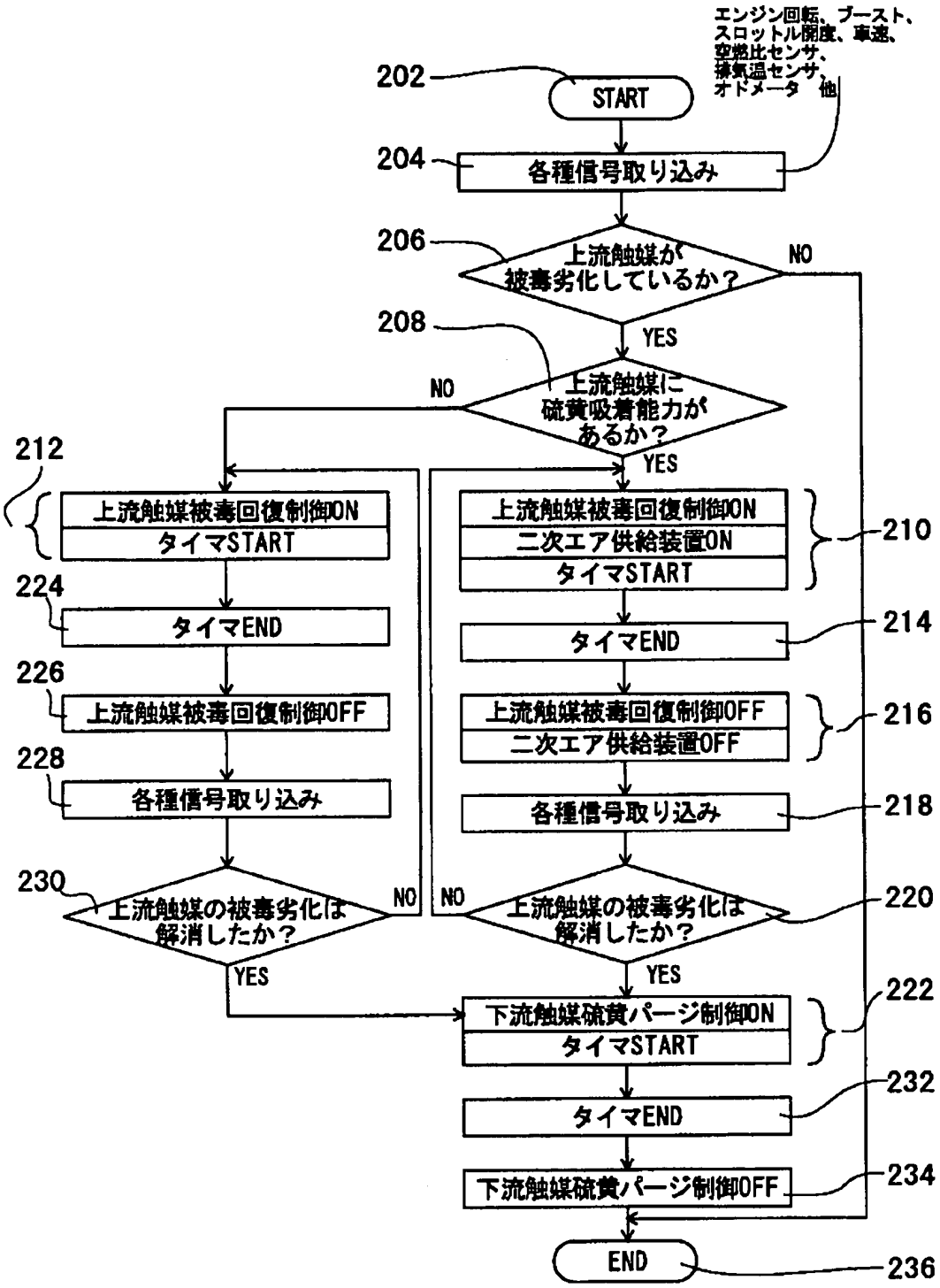
[Drawing 2]



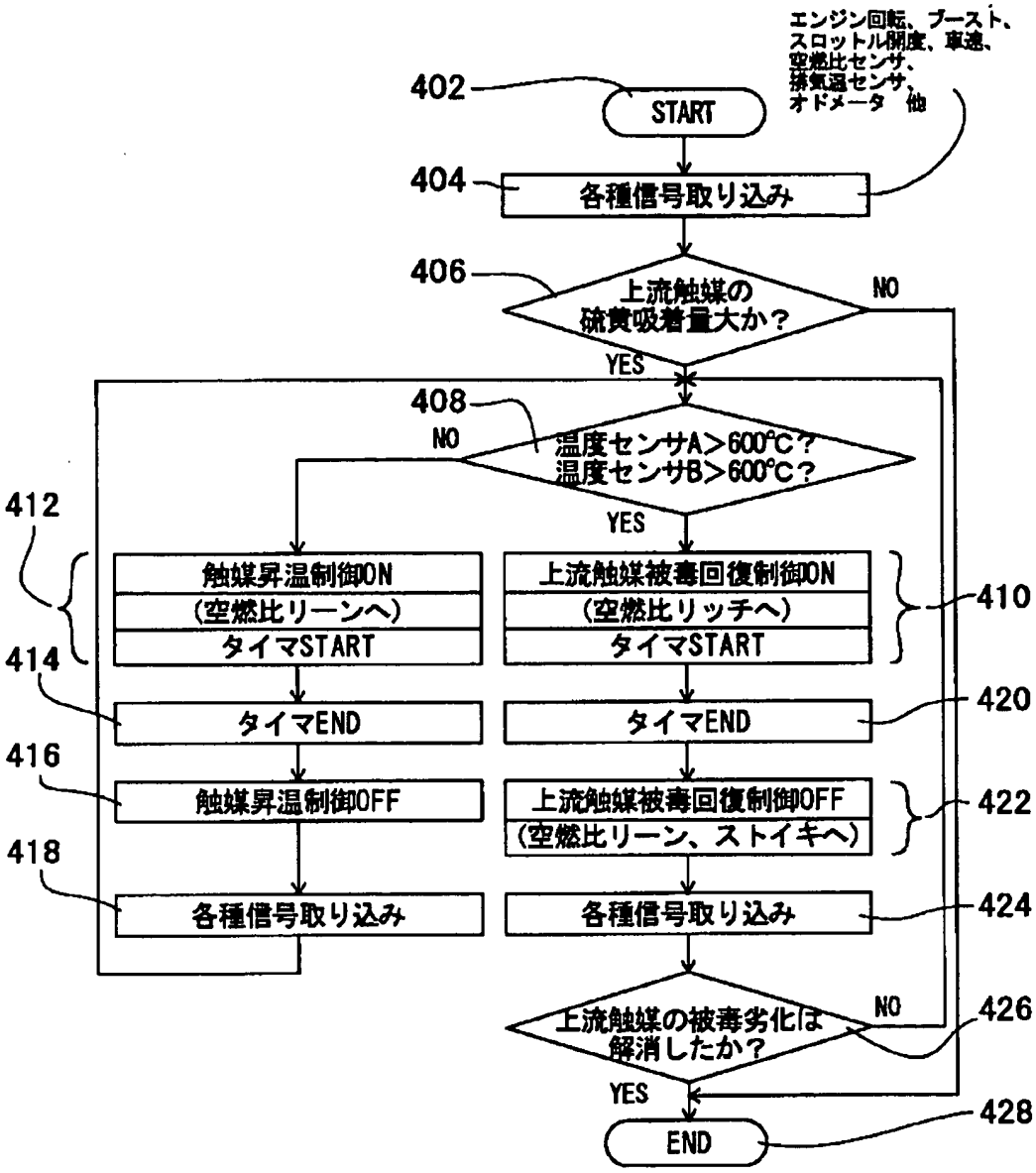
[Drawing 5]



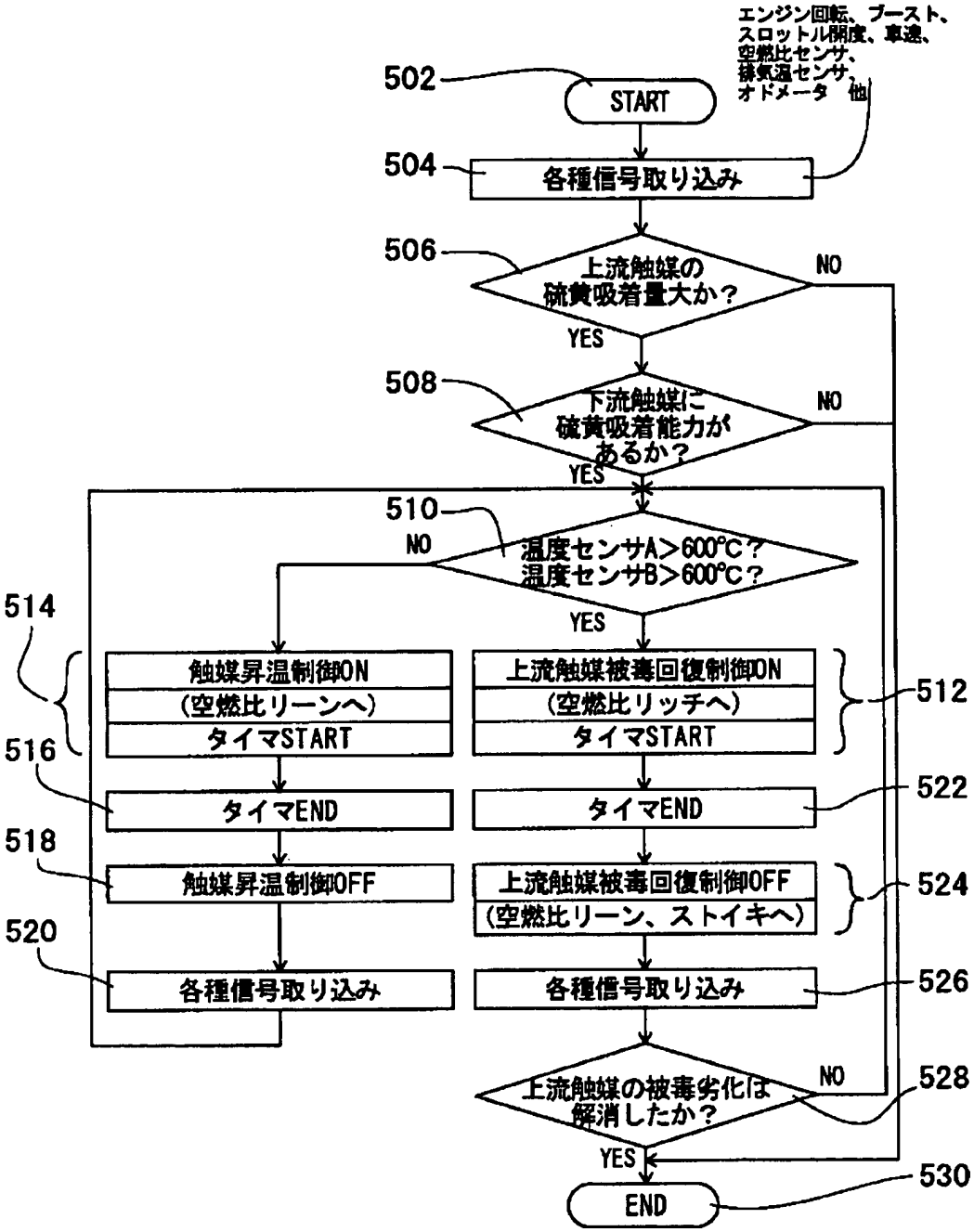
[Drawing 3]


エンジン回転、ブースト、
スロットル開度、車速、
空燃比センサ、
排気温センサ、
オドメータ 他
202
START
204
各種信号取り込み
206
上流触媒が
被毒劣化しているか？
NO
YES
208
上流触媒に
硫黄吸着能力が
あるか？
NO
YES
212
上流触媒被毒回復制御ON
タイマSTART
224
タイマEND
226
上流触媒被毒回復制御OFF
228
各種信号取り込み
230
上流触媒の被毒劣化は
解消したか？
NO
YES
上流触媒被毒回復制御ON
二次エア供給装置ON
タイマSTART
210
タイマEND
214
上流触媒被毒回復制御OFF
二次エア供給装置OFF
216
各種信号取り込み
218
NO
上流触媒の被毒劣化は
解消したか？
220
YES
下流触媒硫黄パージ制御ON
タイマSTART
222
タイマEND
232
下流触媒硫黄パージ制御OFF
234
END
236

[Drawing 6]


エンジン回転、ブースト、
スロットル開度、車速、
空燃比センサ、
排気温センサ、
オドメータ 他
402
START
404
各種信号取り込み
406
上流触媒の
硫黄吸着量大か？
NO
YES
408
NO
温度センサA>600℃？
温度センサB>600℃？
YES
412
触媒昇温制御ON
(空燃比リーンへ)
タイマSTART
上流触媒被毒回復制御ON
(空燃比リッチへ)
タイマSTART
410
414
タイマEND
タイマEND
420
416
触媒昇温制御OFF
上流触媒被毒回復制御OFF
(空燃比リーン、ストイキへ)
422
418
各種信号取り込み
各種信号取り込み
424
上流触媒の被毒劣化は
解消したか？
NO
426
YES
END
428

[Drawing 7]



[Translation done.]